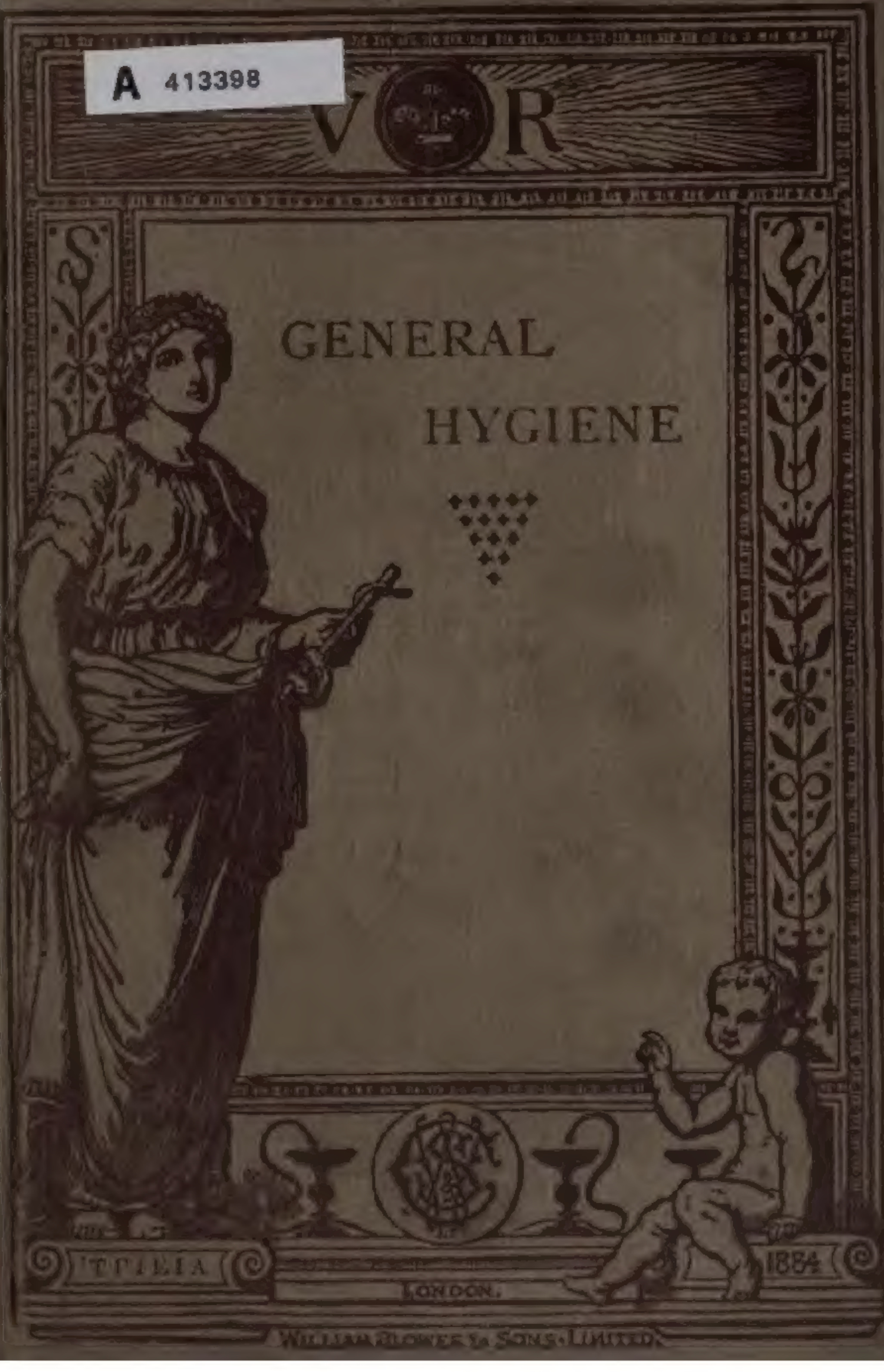
GENERAL HYGIENE



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VOLUME XI.

GENERAL HYGIENE.

CONFERENCES.

METEOROLOGY IN RELATION TO HEALTH.
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ELECTRIC LIGHTING IN RELATION TO HEAL
EPIDEMIC DISEASES.
SCHOOL HYGIENE AND SCHOOL CONSTRUCTION.

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CONFERENCES.

METEOROLOGY IN RELATION TO HEALTH.

CONFERENCES BY THE ROYAL METEOROLOGICAL SOCIETY, THURSDAY and FRIDAY, JULY 17th and 18th.

SOME RELATIONS OF METEOROLOGICAL PHENOMENA TO HEALTH
ENGLISH CLIMATOLOGICAL STATIONS.
THE EQUINOCTIAL GALES—DO THEY OCCUR IN THE BRITISH ISLES?
SOME OCCASIONAL WINDS AND THEIR INFLUENCE ON HEALTH.
CUMULATIVE TEMPERATURE.

METEOROLOGY IN RELATION TO HEALTH.

CONFERENCE ON THURSDAY, JULY 17, 1884.

J. NORMAN LOCKYER, Esq., F.R.S., in the Chair.

1. "*On some Relations of Meteorological Phenomena to Health.*" By JOHN W. TRIPE, M.D.
2. "*English Climatological Stations.*" By G. J. SYMONS, F.R.S.

The CHAIRMAN said, when it was first announced that the subject of Meteorology would form part of the International Health Exhibition, remarks were made that it was not easy to see why such a scientific subject should be brought to the front in connection with such an Exhibition; but without going into details concerning them it might be pointed out that there were one or two general principles outside the region of Meteorology altogether, which taught in the clearest manner that really both meteorologists and physicians ought to magnify their office, and to say that there could be no health without meteorology, and no care of the human body without it; and, therefore, that practically they were after all playing the part of the Prince of Denmark in the play of 'Hamlet.' The general principles to which he referred were shortly these. On examining the various masses of matter external to our own planet in the Universe, the greatest diversity would be found amongst those bodies which could be

approached most easily, such as the stars, those diversities consisting chiefly of difference of temperature and of composition. There were more than twenty-two millions of stars within our ken, and probably each of those twenty-two millions was in some way unlike any other. The globe on which they dwelt, however, was not a star, that was to say, it was not in a state of incandescence, having cooled down, but the central body around which it revolved year by year, was a star. Reasoning by analogy, it might be supposed that a great number of those twenty-two millions of stars had planets revolving round them in the same way as the earth revolved around its central luminary; and again, reasoning by analogy, it might be said, almost for certain, that those planets revolving round those stars must vary as much amongst themselves as did the central bodies, and that those planets were cooling bodies like the earth. Approaching the subject of cosmical meteorology, a study of the planetary system had shown the great probability in some cases, and the great improbability in others, of the existence of life on those planets, so that the meteorological condition of each of those masses of matter external to the earth dominated the possibility of life, and *à fortiori*, they must dominate the possibility of health. In fact, if health were a matter of any importance at all, meteorology must lie at the base of all true knowledge of anything relating to health, so far as the condition of existence on a mass of cooling matter revolving round an incandescent one was concerned. That was a broad general statement, which must be considered to be absolutely true, although it was very much out of the common run of thought. I was not for him to point out with regret that these ve broad views of the functions of meteorology had not yet received the attention they demanded, but he not know that a question of this breadth could be put before those who were competent to deal with i to lead further along the lines which it suggested, t such an Exhibition as the present one. Having h

honour of being made Chairman of the Jury which had to do with meteorological instruments, he had had the pleasure of meeting various foreign jurors who were at work in allied fields, and nothing had struck him more than the very fruitful way in which the intercourse thus brought about promised to do good all round, more especially in enforcing those general views which were connected with such questions as he had suggested. In fact, in that Exhibition itself, there were a number of exhibits from foreign countries of extreme importance on matters dealing with these important questions.

ON SOME RELATIONS OF METEOROLOGICAL PHENOMENA TO HEALTH.

By JOHN W. TRIPE, M.D., M.R.C.P. Ed., F.R. Met. Soc.,

Medical Officer of Health for Hackney.

IN ages long past these relations excited much attention, but the knowledge concerning them was of the vaguest kind ; and indeed, even now, no very great advance has been made, because it is only quite recently that we have been able to compare a fairly accurate record of deaths with observations taken at a number of reliable meteorological stations. The more useful and searching comparison between cases of sickness, instead of deaths, and meteorological phenomena has yet to be accomplished on a large scale in this country, and especially as regards zymotic diseases. In Belgium there is a Society of Medical Practitioners, embracing nearly the whole country, that publishes a monthly record of cases of sickness, of deaths, and of meteorological observations ; but the only attempt on a large scale in this country, which was started by the Society of Medical Officers of Health for the whole of London, failed, partly from want of funds, and partly from irregularity in the returns. My remarks, which must necessarily be very brief, will refer to the relations between

(1) meteorological phenomena and the bodily functions of man, and (2) between varying meteorological conditions and death-rates from certain diseases.

As regards the first, I will commence with a few brief remarks on the effects of varying barometric pressures. A great deal too much attention is paid to the barometer if we regard it as indicating only, as it really does, variations in the weight of the column of air pressing upon our bodies, because, except at considerable elevations, where the barometer is always much lower than at sea-level, these variations produce but little effect on health. At considerable elevations the diminished pressure frequently causes a great feeling of malaise, giddiness, loss of strength, palpitation, and even nausea; and at greater heights, as was noticed by Mr. Glaisher in a very lofty balloon ascent, loss of sight, feeling, and consciousness. These are caused by want of a sufficient supply of oxygen to remove effete matters from the system, and to carry on the organic functions necessary for the maintenance of life. On elevated mountain plateaus, and health stations on the Alps, an increased rapidity in the number of respirations and of the pulse, as well as increased evaporation from the lungs and skin, occur.

For some years past, a considerable number of persons suffering from consumption, gout, rheumatism, and anæmic affections have gone to mountain stations, chiefly in Switzerland, for relief, and many have derived much benefit from the change. It must not, however, be supposed that diminished atmospheric pressure was the chief cause of the improvement in health, as its concomitants, viz., a diminution in the quantity of oxygen and moisture contained in each cubic foot of air, probably the low temperature, with a total change in the daily habits of life, have assisted ir the beneficial results. The diminution in the quantity o air, and consequently of oxygen, taken in at each breat] is to a certain extent counterbalanced by an increas frequency and depth of the respirations, and a grea capacity of the chest. In this country, alterations in

barometric pressure are chiefly valuable as indicating an approaching change in the wind, and as well as of the amount of moisture in the air; hence the instrument is often called "the weather-glass." A sudden diminution in the atmospheric pressure is likely to be attended with an escape of ground air from the soil, and therefore to cause injury to health, especially amongst the occupants of basement rooms, unless the whole interior of the building be covered with concrete.

Temperature.—Experience has shown that man can bear greater variations of temperature than any other animal, as in the Arctic regions a temperature of *minus* 70 degrees Fahrenheit, or more than 100 degrees below freezing-point, can be safely borne; that he can not only live but work, and remain in good health in these regions, provided that he be supplied with suitable clothing and plenty of proper food. On the other hand, man has existed and taken exercise in the interior of Australia, when the thermometer showed a temperature of 120 degrees Fahrenheit, or nearly 90 degrees above freezing-point, so that he can live and be in fairly good health within a range of nearly 200 degrees Fahrenheit.

The effects of a high temperature vary very much according to the amount of moisture in the air, as when the air is nearly saturated in hot climates, or even in summer in our own, more or less languor and malaise are felt, with great indisposition to bodily labour. With a dry air these are not so noticeable. The cause is evident; in the former case but little evaporation occurs from the skin, and the normal amount of moisture is not given off from the lungs, so that the body is not cooled down to such an extent as by dry air. Sunstroke is probably the result, not only of the direct action of the sun's rays, but partly from diminished cooling of the blood by want of evaporation from the lungs and skin.

The effects of temperature on man does not depend so much on the mean for the day, month, or year, as on the extremes, as when the days are hot and the nights com-

paratively cool, the energy of the system becomes partially restored, so that a residence near the sea, or in the vicinity of high mountains, in hot climates is, other things being equal, less enervating than in the plains, as the night air is generally cooler. It is commonly believed that hot climates are *necessarily* injurious to Europeans, by causing frequent liver derangements and diseases, dysentery, cholera, and fevers. This, however, is, to a certain extent, a mistake, as the recent medical statistical returns of our army in India show that in the new barracks, with more careful supervision as regards diet and clothing, the sickness and death-rates are much reduced. Planters and others, who ride about a good deal, as a rule keep in fairly good health; but the children of Europeans certainly degenerate, and after two or three generations die out, unless they intermarry with natives, or make frequent visits to colder climates. This fact shows that hot climates, probably by interfering with the due performance of the various processes concerned in the formation and destruction of the bodily tissues, eventually sap the foundations of life amongst Europeans; but how far this result has been caused by bad habits as regards food, exercise, and self-indulgence, I cannot say. Rapid changes of temperature in this country are often very injurious to the young and old, causing diarrhœa and derangements of the liver when great heat occurs, and inflammatory diseases of the lungs, colds, &c., when the air becomes suddenly colder, even in summer.

The *direct* influence of *rain* on man is not very marked in this country, except by giving moisture to the air by evaporation from the ground and from vegetable life, and by altering the level of ground water. This is a subject almost overlooked by the public, and it is therefore as well that it should be known that when ground water has a level, persistently less than five feet from the surface of the soil, the locality is usually unhealthy, and should not, if possible, be selected for a residence. Fluctuations in the level of ground water, especially if great and sudden, generally cause

ill-health amongst the residents. Thus, Dr. Buchanan in his Reports to the Privy Council in 1866-67, showed that consumption (using the word in its most extended sense) is more prevalent in damp than on dry soils, and numerous reports of medical officers of health, and others, which have been published since then, show that an effective drainage of the land, and consequent carrying away of the ground water, has been followed by a diminution of these diseases.

Varying amounts of moisture in the air materially affect the health and comfort of man. In this country, however, it is not only the absolute but the relative proportions of aërial moisture which materially influence mankind. The quantity of aqueous vapour that a cubic foot of air can hold in suspension, when it is saturated, varies very much with the temperature. Thus at 40 degrees Fahr. it will hold 2·86 grains of water; at 50 degrees, 4·10 grains; at 60 degrees, 5·77 grains; at 70 degrees, 8·01 grains; and at 90 degrees as much as 14·85 grains. If saturation be represented by 100, more rapid evaporation from the skin will take place at 70 degrees with 75 per cent. of saturation, than at 60 degrees when saturated, although the absolute quantity of moisture in the air is greater at the first-named temperature than at the latter. As regards the lungs, however, the case is different, as the air breathed out is, if the respirations be regular and fairly deep, completely saturated with moisture at the temperature of the body. In cold climates the amount of moisture and of the effete matters given off from the lungs in the expired air, is much greater than in hot climates, and the body is also cooled by the evaporation of water in the form of aqueous vapour. Moist air is a better conductor of heat than dry air, which accounts for much of the discomfort felt in winter when a thaw takes place as compared with the feeling of elasticity when the air is dry. In cold weather, therefore, moist air cools down the skin and lungs more rapidly than dry air, and colds consequently result. London fogs are injurious, not only on account of the various vapours given off by the

combustion of coal, but in consequence of the air being in winter generally saturated with moisture at a low temperature. The injuriousness of fogs and low temperatures will be presently dwelt upon at greater length.

Variations in the pressure and temperature of the atmosphere exert a considerable influence on the circulation of air contained in the soil, which is called ground air. As all the interstices of the ground are filled with air or water, the more porous the soil, the greater is the bulk of air. The quantity of air contained in soil varies very much according to the material of which the soil is composed, as it is evident that in a gravelly or sandy soil it must be greater than when the ground consists of loam or clay. The estimates vary from 3 to 30 per cent., but the latter is probably too high. If, therefore, a cesspool leak into the ground, the offensive effluvia, if in large quantities, will escape into the soil, and are given off at the surface of the ground, or are drawn into a house by the fire; but, if small, they are rendered innocuous by oxidation. The distance to which injurious gases and suspended or dissolved organic matters may travel through a porous soil is sometimes considerable, as I have known it pass for 130 feet along a disused drain, and above 30 feet through loose soil.

Winds exercise a great effect on health both directly and indirectly. Directly, by promoting evaporation from the skin, and abstracting heat from the body in proportion to their dryness and rapidity of motion. Their indirect action is more important as the temperature and pressure of the air depend to a great extent on their direction. Thus, winds from the N. in this country, are usually concomitant with a high barometer and dry weather; in summer with a pleasant feeling, but in winter with much cold. S.W. winds are the most frequent here of any, as about 24 per cent. of the winds come from this quarter against $16\frac{1}{4}$ from the W., $11\frac{1}{5}$ from the E., and the same from the N.E.; $10\frac{1}{2}$ from the S., 8 from the N., and a smaller number from the other quarters. S.W. winds are also those which

are most frequently accompanied by rain as about 30 per cent. of the rainy days are coincident with S.W. winds. Another set of observations give precisely the same order, but a considerable difference in their prevalence, viz., S.W. 31 per cent., W. 14½, and N.E. 11½ per cent. Easterly winds are the most unpleasant, as well as the most injurious to man, of all that occur in this country.

I now propose discussing very briefly the known relations between meteorological phenomena and disease. I say the known relations, because it is evident that there are many unknown relations, of which at present we have had the merest glimpse. For instance, small-pox, while of an ordinary type, and producing only a comparatively small proportion of deaths to those attacked, will sometimes suddenly assume an epidemic form, and spread with great rapidity at a time of year and under the meteorological conditions when it usually declines in frequency. There are, however, in this country known relations between the temperature and, I may say, almost all diseases. As far back as 1847, I began a series of elaborate investigations on the mortality from scarlet fever at different periods of the year, and the relations between this disease and the heat, moisture, and electricity of the air. I then showed that a mean monthly temperature below 44·6 degrees Fahr. was adverse to the spread of this disease, that the greatest relative decrease took place when the mean temperature was below 40 degrees, and that the greatest number of deaths occurred in the months having a mean temperature of between 45 and 57 degrees Fahr. Diseases of the lungs, excluding consumption, are fatal in proportion to the lowness of the temperature and the presence of excess of moisture and fog. Thus in January, 1882, the mean weekly temperature fell from 43·9 Fahr. in the second week to 36·2 degrees in the third, with fog and mist. The number of deaths registered in London during the third week, which may be taken as corresponding with the meteorological conditions of the second week, was 1700, and in the next week 1971. Unusual cold, with frequent

fogs and little sunshine, continued for four weeks, the weekly number of deaths rising from 1700 to 1971, 2023, 2632, and 2188. The deaths from acute diseases of the lungs in these weeks were respectively 279, 481, 566, 881, and 689, showing that a large proportion of the excessive mortality was caused by these diseases. At the end of November and in December of the same year there was a rapid fall of temperature, when the number of deaths from acute diseases of the lungs rose from 297 to 358, 350, 387, 541, 553, and 389 in the respective weeks. From November 29 to December 9 the sun was seen only on two days for 4½ hours, and from December 9th to the 18th also on two other days for less than 4 hours, making the total amount of sunshine 8·1 hours only in 20 days. In January and February the excess of weekly mortality from all diseases reached the large number of 504 deaths; in December it was less, the fogs not having been so dense, but the excess equalled 246 deaths per week. In January 1881 there was much greater and long-continued cold, but the mortality was smaller, as there was less fog, and the oscillations of temperature were not so large.

The relations between a high summer temperature and excessive mortality from diarrhœa have long been well known, but the immediate cause of the disease as an epidemic is not known. Summer diarrhœa prevails to a greater extent in certain localities, notably in Leicester (and has done so for years); and the cause has been carefully sought for, but has not been found out. Recent researches, however, point to a kind of bacillus as the immediate cause, as it has been found in the air of water-closets, in the traps under the pans, and in the discharges from infants and young children.* In order to indicate more readily how intimately the mortality from diarrhœa depends on temperature, I now lay before you a table showing the mean temperature for ten weeks in summer,

* In my Sanitary Report to the Hackney Board of Works for 1879 I pointed out the presence of bacteria in the air of water closets, and in the contents of traps during hot weather, and the prevalence of summer diarrhœa.

of seven cold and hot summers, the temperature of Thames water, and the death-rates of infants under one year per million population of London :—

LONDON. DEATHS UNDER 1 YEAR, IN JULY, AUGUST, AND PART OF SEPTEMBER, FROM DIARRHŒA PER 1,000,000 POPULATION LIVING AT ALL AGES, ARRANGED IN THE ORDER OF MORTALITY.

Years.	Mean Temperature, 10 Weeks.	Temperature of Thames Water	Age 0–1 Year. Deaths from Diarrhœa per 1,000,000 population living at all Ages.
	°	°	
1860	58·1	60·6	151
1862	59·0	62·0	189
1879	58·7	60·7	228
1877	61·2	63·3	347
1874	61·7	63·8	447
1878	63·7	64·1	576
1876	64·4	64·9	642

As may be seen, the deaths of infants under 1 year of age from diarrhœa per 1,000,000 population was only 151; whilst the mean summer temperature was only 58·1 degrees Fahr., against 189 in 1862, when the mean temperature was 59·0 degrees. In 1879, when the mean temperature was 58·7 degrees, the deaths from diarrhœa rose to 228 per million, but a few days were unusually hot. In 1877 the mean temperature of the air was 61·2 degrees, of the Thames water 63·3 degrees, and the mortality of infants from diarrhœa 347 per million population. In 1874, when the mean temperature of the air was 61·7 degrees, the mortality rose to 447 per million; and in the hot summers of 1878 and 1876, when the mean air temperatures were 63·7 and 64·4 degrees respectively, the death-rates of infants were 576 and 642 per million population. The relations, therefore, between a high summer temperature and the mortality from diarrhœa in infants are very intimate. I have selected the mortality amongst infants in preference to that at all ages, as the deaths occur more

quickly, and because young children suffer in greater proportion than other persons.

The proportionate number of deaths at *all ages* from diarrhœa corresponds pretty closely with those of infants. To prove this, I made calculations for three years, and ascertained that only 3·9 per cent. of all the deaths from this disease were registered in the weeks having a temperature of less than 50 degrees; 11·9 per cent. in the weeks having a temperature between 50 degrees and 60 degrees, whilst in the comparatively few weeks in which the temperature exceeded 60 degrees Fahr., as many as 84·2 per cent. of the total number of deaths was registered. In the 17 years 1840–56, for which many years ago I made a special enquiry, only 18·9 per cent. of all the deaths from diarrhœa occurred in winter and spring, against 81·1 per cent. in summer and autumn. In the 20 years, 1860–79, there were seven years in which the summer temperature was in defect when the mortality per 100,000 inhabitants of London was 200; whilst in 10 summers, during which the temperature was in excess by 2 degrees or less, the mortality was 317 per 100,000. The mean temperature was largely in excess, that is to say, more than 2 degrees plus in three of these summers, when the mortality reached 339 per 100,000 inhabitants. These figures show that great care should be taken in hot weather to prevent diarrhœa, especially amongst young children; by frequent washing with soap and water to ensure cleanliness, and proper action of the skin; by great attention to the food, especially of infants fed from the bottle; free ventilation of living rooms, and especially of bedrooms; and by protection, as far as possible, being afforded from a hot sun, as well as by avoiding excessive exercise. All animal and vegetable matter should be removed from the vicinity of dwelling-houses as quickly as possible (indeed these should be burnt instead of being put in the dust-bin), the drains should be frequently disinfected and well flushed out, especially when the mean daily temperature of the air is above 60 degrees Fahr.

Time will not admit of more than a mere mention of the relations between meteorological phenomena and the mortality from many other diseases and affections, such as apoplexy from heat, sunstroke, liver diseases, yellow fever, cholera, whooping-cough, measles, and several other affections. A comparison between the mortality from several diseases in this and other countries shows that certain of these do not prevail under closely corresponding conditions. Thus the curves of mortality from whooping-cough, typhoid fever, and scarlet fever, do not correspond with the curves of temperature in both London and New York, and the same may be said of diarrhœa in India. It is therefore evident that some other cause or causes than a varying temperature must be concerned in the production of an increased death-rate from these diseases. The subject is of great importance, and I do not despair of our obtaining some day a knowledge of the agents through which meteorological phenomena act in the production of increased and decreased death-rates from certain diseases, and the means by which, to a certain extent, these injurious effects on man may be prevented.

ENGLISH CLIMATOLOGICAL STATIONS.

By G. J. Symons, F.R.S.,

Secretary of the Royal Meteorological Society.

The Royal Meteorological Society has equipped a Climatological Station in the grounds of the International Health Exhibition, in order that any one desirous of organising a station may see one arranged in accordance with the regulations of the Society. It must be stated at the outset, however, that the enclosure is much too small, but the exigencies of the Exhibition would not permit of more space being granted. The object of the Climatological Station is to determine the elements of the climate of a place, hence only such instruments are used as are necessary for that purpose. These consist of a maximum, a minimum, a dry and a wet bulb thermometer, which are mounted

in a Stevenson screen of the Society's pattern, and a rain-gauge.

The screen is a double-louvred box, its internal dimensions being: length, 18 inches; width, 11 inches, and height, 15 inches; with a double roof, the outer one sloping from front to back, *i.e.*, from north to south. The front, or northern side of the screen, is hinged as a door, and opens downwards. This screen is placed in an exposed situation over grass, and is mounted on posts at such a height that the bulbs of the thermometers are 4 feet above the ground. The thermometers are suspended on uprights near the middle of the screen, the maximum and minimum being in front of the dry and wet. The maximum thermometer registers the highest, and the minimum the lowest, temperature during any interval. The dry bulb shows the temperature of the air at the time. The bulb of the wet thermometer is covered with a piece of fine muslin, which is kept damp by the capillary action of a few threads of cotton fastened round the neck of the bulb, their other ends being immersed in a cup of water. As evaporation takes place from the muslin a reduction of temperature ensues, and hence this thermometer reads lower than the dry bulb. The drier the air, the greater is the difference between the readings of these two thermometers. So, by this very simple method, we have a means of ascertaining the humidity of the air.

From observations of these instruments the highest, lowest, and mean temperatures, the range of temperature, as well as the humidity of the air of any locality, can be obtained. Each of these conditions, as is well known, exerts a very great influence on health. This is especially true in the case of range of temperature, as two places having the same mean temperature during a certain period may differ very considerably in range of temperature, one town having a generally equable temperature, while another may be subject to great extremes of heat and cold. It is, therefore, very necessary to ascertain the range of temperature, in choosing a health resort, or a place

of residence, either for invalids or even for persons enjoying good health. The humidity of the air is also of great importance in determining the climate of a place, as dry air agrees with some persons, while moist air is more suitable for others; and the effect of moisture on health being largely regulated by temperature, both must be taken into account.

It was stated at the outset that a rain-gauge formed part of the equipment necessary for a Climatological Station. Now, although rainfall does not appear to exert so direct an influence on health as do temperature and humidity, nevertheless it has indirectly a very great power over the health and well-being of man. Every water supply depends, either directly or indirectly, on the amount of rainfall, and our own existence depends upon the amount of water supply, as everything on which we subsist is dependent for its life and growth on the amount of rainfall. Observations of rainfall are also most important to engineers, as in planning a water supply for any town they can, by means of rainfall observations, ascertain where in the neighbourhood most rain falls, and place the reservoirs accordingly. Also in carrying out the drainage of any place it is necessary, first of all, that the engineer should know the greatest rainfall he may have to provide for, so that he may make his sewers of such dimensions that they may be able to carry off a large and heavy fall of rain without any inconvenience or flooding, or may be so arranged as to exclude it.

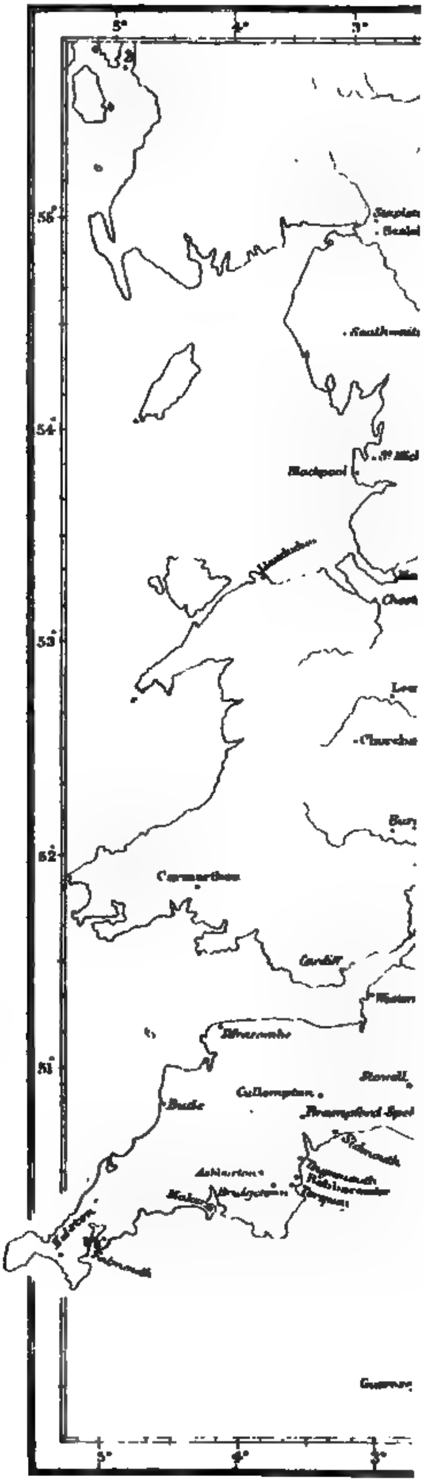
It was therefore in the hope that similar stations may be started at as many as possible of the English health and sea-side resorts, that the Royal Meteorological Society erected the equipment necessary for a "Climatological Station." Up to the present time, the Society has succeeded in establishing 82 stations in widely separated localities, from each of which monthly returns of observations made with accurate and verified instruments are received; and each station regularly inspected by the Assistant-Secretary. The positions of these stations are shown on the accom-

panying map, and, from a single glance at their distribution over the country, it is obvious that there is still room for many more. Take the coast from the Thames to the Land's End. We find the following sea-bathing places without any records being sent to the Society respecting their temperature or humidity:—Herne Bay, Westgate, Broadstairs, Deal, Dover, Folkestone, Sandgate, Hythe, St. Leonards, Eastbourne, Seaford, Brighton, Littlehampton, Bognor, Hayling Isle, Southsea, Cowes, Ryde, Sandown, Shanklin, Freshwater, Bournemouth, Charmouth, Lyme Regis, Axmouth, Seaton, Budleigh Salterton, Exmouth, Dawlish, Brixham, Kingswear, Looe, Fowey, and Penzance. Thirty-four places on the South Coast alone, each doubtless possessing features different from every other, slight, probably, in some cases, as, for example, Littlehampton and Bognor; but extremely marked in others, as, for instance, Dover and Penzance, or—to take two nearer places—Ryde and Shanklin. It is this deficiency in information from so many important places which has induced the Royal Meteorological Society to endeavour to obtain additional help by making the need of records from such places more widely known.

It is difficult to fix the number of stations requisite because it depends so largely on the physical configuration of the district, and even of the towns. For instance, an author some time ago wrote a pamphlet on Brighton and its three climates, and a moment's consideration will convince any one that the difference, say, between Maze Hill, St. Leonards, and the Marina, St. Leonards; or between High Harrogate and Low Harrogate, is greater than in other parts of the country would be produced by dozens of miles of distance.

Still, the first object of the Royal Meteorological Society is to lay a foundation by discussing and publishing accurate observations made with tested instruments, all mounted uniformly, all read at the same instant of local time, and recorded and in every way discussed upon a uniform system.

This in the Society's 'Meteorological Record,' which is


5°
4°
3°
55°
54°
53°
52°
51°
Blackpool
Carmarthen
Cardiff
Ilfracombe
Bude
Cullompton
Ashburton

published quarterly, it has now done for nine years, and the author trusts that by degrees the medical men of this country will increasingly refer to the publications of the Society for accurate data as to the climates of our various health resorts; because the many demands on the time of a physician necessarily render it impossible for him to obtain personal knowledge of the climate of the dozens of English watering places by a permanent residence in each of them.

Some years since the author urged the collection, by a commission of experts, of a complete statistical record of the health-rate, death-rate, geology, climate, water supply, drainage, and general condition of all our mineral water, sea-bathing, or pure air resorts; and he adheres to the opinion that the collection of such statistics would have both direct and indirect beneficial effects infinitely beyond the cost of the enquiry. But it must be done by authorities of unquestioned position, men who are not only beyond all bribery, but who would and could give personal care to see that absolute impartiality and absolute justice ruled throughout.

DISCUSSION.

Mr. LAUGHTON said Dr. Tripe had referred to the effects of low barometer pressure on the human frame as producing *malaise*, sickness, and other disagreeable effects; but he had heard experienced mountaineers say that a great deal of that was simply due to want of training. They knew from the sickness felt in balloon ascents that it was not entirely owing to that cause, though a great deal of it might be. If any one who had been living for ten months in London, not breathing always the freshest of air, going to bed later than he ought, and very probably eating and drinking more than he ought to, suddenly went into a hilly country, and determined to ascend a mountain, it was found that by the time he got a few thousand feet up he did not feel very cheerful. A curious obser-

vation had been made by Dr. Forbes in the Andes, where he made some measurements of a tribe who lived and worked at an elevation of nearly 14,000 feet; he found the average chest measurement of a man was something like 46 inches, which struck him at the time as enormous, but probably these people, living generation after generation in that peculiar climate, had gradually developed chests of that extreme size. What had been said about moisture as affecting climate struck him very much, and was probably familiar to all who had been in hot countries. He might say that the hottest day he ever felt was when the thermometer was only 85 degrees, though he had experienced temperatures a great deal higher than that, but probably at the time to which he referred the air was saturated with moisture.

Mr. R. H. SCOTT, F.R.S., remarked, in reference to mountain sickness, that Mr. Whymper had given him a very accurate description of his own sensations in that way. He took up two Swiss guides with him in some of his ascents, and when they got up to 14,000 or 15,000 feet, they all three of them felt this mountain sickness. They had certainly not come recently from London dinners. Mr. Whymper cured himself by using chlorate of potash; but they had with them a gentleman who had lived for some years at Quito, and who had not lived a remarkably regular life, and who was apparently very delicate, but he was perfectly free from this mountain sickness, having lived there for several years. Mr. Whymper found it took about four or five days to overcome these symptoms entirely, and after his getting over it it did not return. With reference to the feeling of sickness in balloon ascents, he was rather disposed to consider that that was not usually connected with the ascent, but it was more related to a form of sickness, from which few people were free, due to the motion. Those who went up in the captive balloon at Paris found themselves swaying about as if on a very rough sea, and he had heard of officers who, in the experiments carried on at Chatham with a captive balloon, found it so unpleasant

that they cut themselves loose, and when the balloon was free they found no perceptible motion at all; he fancied, therefore, it was something in the nature of sea-sickness.

Dr. MANN said he believed that the effect of the low barometer in producing the effects it did on the animal frame, was almost always connected with the effect of muscular action. This undoubtedly was the case in making mountain ascents, and he had no doubt that in nine cases out of ten where you had a low barometer, the nervous discomfort was due to the fact that the individual suffering from it endeavoured to make the same energetic muscular action that he would under ordinary circumstances. If you noticed the guides in any mountain district, they generally moved at about one-fourth the pace of the party they accompanied. The highest climb he had ever done did not exceed 8,000 feet; but having carefully observed the effects on his own experience, he found that by diminishing his muscular efforts to that of his guide, he was instantly free from all nervous pressure. Persons making a new kind of action, and bringing a new series of muscles into play day after day for a little time, soon found a compensation provided which got over those unpleasant effects. Mr. Scott would probably say that persons did not make muscular efforts in a balloon, but he had himself explained that the swaying motion there was closely analogous to sea-sickness. The recent investigations which had been made were very important, as showing that the capacity of the chest increased with those who lived at high altitudes. Amongst some of the best observations on this point were those made within the last two or three years by Dr. Theodore Williams, who had a large connection with Davos Platz, and, when making one or two visits there recently, he made some most exact and careful measurements of the chest capacities of the persons living in those climates. He found there was a much larger capacity of chest amongst them than amongst persons living at lower altitudes, all those circumstances being similar. The only other point he wished to refer to was

to record very strongly his opinion of the value of the investigations which were entered upon in recent years by such societies as the Royal Meteorological, and also the extreme value of such modes of illustrating that science as were now to be seen in the Exhibition. Going into the small Annexe allotted to the Society a series of charts would be found, which were full of the most valuable information. When the room was first opened he went in and looked at them, knowing something of these things, and having thought about them for many years, but there were some charts there which he did not quite understand the meaning of. He went to two or three persons, and asked them to tell him, but one very frankly answered that he did not know, and altogether he did not get much light upon the matter; but having studied them a little longer himself, in order to complete his own knowledge, he wrote to a friend who did know, and got some inkling of what was meant; then, for the first time, he apprehended their true value. He mentioned this to point out that charts of this kind were of little value until their whole meaning was mastered by the popular mind; but then it would cling to them through life, and show the value of this science as connected with human health. He would not go further into the subject now, because it would be dealt with on the following day by Mr. Scott. In the absence of Dr. Compton, of Bournemouth, he would say that there was one particular work now being done at Southbourne, which was about half-way between Christchurch and Bournemouth, which was of great importance. For two or three years Dr. Compton had been carefully and closely watching the records of sunshine, and it appeared that that locality stood second, Hastings being first of all, on the south coast, where observations had been made with regard to sunshine. He hoped before long they would have many more valuable records on that point.

Dr. F. W. CORY said he had listened with great pleasure to Dr. Tripe's highly interesting and instructive Paper, and should like to supplement his experience with a remarkable

fact discovered in regard to the effect of certain states of the atmosphere on the symptoms of whooping-cough, and which fact was a stepping-stone to a great improvement in the treatment of that disease. During March and April, 1882, a rather severe epidemic of whooping-cough occurred at Chingford, a small village about ten miles to the north of London; whilst watching the course of the cases, he noticed on several occasions a decided remission in the symptoms, and then at other times a marked aggravation. This induced him to suspect some powerful atmospheric influences at work, and on consulting his charts he found that the increase in the number and violence of the whoops corresponded to an absence or a very low percentage of ozone or other purifiers in the air, whilst on the other hand, a decrease was accompanied by an extremely deep tinting of the ozone papers. This seemed to suggest a new line of treatment, and forthwith all his little patients suffering from this disease were treated with an antiseptic medium internally, and the result, he was pleased to say, was very satisfactory; and, moreover, further experience confirmed the plan adopted. He had not yet published in any of the medical journals this new therapeusis of whooping-cough. He would have done it before, but so many specifics had been recommended and found wanting, that he was loath to prematurely risk the possible addition of another to the list of multitudinous drugs of a questionable nature used in this complaint. The present time, however, seemed to be a happy one for making it public. It was just as well to refer to the fact that the pocket spectroscope would prove a rough and ready but reliable ozonometer to those who did not suffer from colour-blindness, and who possessed the requisite acuteness of vision.

Mr. C. G. Talmage, referring to the observations which had lately been made as to the duration of sunshine at various spots, suggested that it was a misnomer, to term the instrument used a sunshine recorder; it was not anything of the kind, it was a clear sky recorder, and the reason he said so was this: He had used one for nearly eight months, and he found that during the presence of the very

thinnest and faintest cirrus cloud there was no trace whatever of sunshine. When speaking amongst themselves, they would say they had had a glorious sunshiny day, though on the register they might find no trace of it at all. Then perhaps they might get a very heavy thunderstorm, lasting half-an-hour, which would saturate the paper, and, though it was clear afterwards, until that paper was dried there was another half or three-quarters of an hour at least before the clear sky was again recorded. He was not at all disparaging the sunshine recorder as an instrument, but he would recommend persons not to pin their faith in seeking a health resort on the amount of sunshine as shown by the recorder. If it were called a clear sky recorder, he should be quite satisfied.

Mr. MAWLEY said he had used the sunshine recorder, and he found it recorded all sunshine likely to have the slightest effect as regarded health or vegetation. It did not take three-quarters of an hour to burn through a saturated card, but more nearly three-quarters of a minute. He wished, however, to speak with regard to the temperature, which perhaps had more influence on health than any other element observed at a meteorological station. In fact, the first observation made with respect to any climate was generally as to the temperature. It became, therefore, of great importance to have a correct mode of gauging the temperature in different localities, and comparing them one with another. At first sight it might appear a very unnatural proceeding to place thermometers in one of those screens, but on a careful consideration of the subject it would be seen that no better method could be adopted. The double louvres shut out entirely the direct rays of the sun, and direct radiation from below, which on cold clear nights prevented the minimum thermometer cooling down unduly. In fact, the thermometers were influenced by hardly anything but the currents of air passing through them. But with regard to the advantages of this screen, ome meteorologists had regarded the temperature taken em with more or less suspicion. Some said that the became heated by the sun's rays, so that the heat was

conveyed ultimately to the thermometer; others, that the louvres being exposed to the full rays of the sun for many hours became too hot, and that the air passing through them into the screen must be heated; whilst others held that they were so poorly ventilated that they doubted whether the air ever did get into them or how it could get out. Now he hoped to show that these screens were far more trustworthy than had been supposed. For the purpose of experiment he had placed two of these screens on his own lawn, precisely alike in all respects, except that whilst one was unprotected the other was shaded on the top and on the south and west sides by means of canvas. They were only a few yards apart, and the thermometers placed in them, kindly lent by Messrs. Negretti and Zambra, were precisely alike. He found that among the maximum observations for the nine hottest days of the year the shaded screen was less than 0°·2 below the unshaded one. In order further to test it at three o'clock he took observations with the dry bulb, and taking the seven hottest days of the year—no observations being taken under 75°—he found that the mean dry bulb reading of the shaded screen was 78°·6, whilst that of the unshaded screen was 78°·3, and with the sling thermometer 78°·5. The rather low temperature in the unshaded screen he attributed to the shadow of a chimney coming within two yards of the screen and cooling the ground, and consequently, to a slight extent, the air in the screen. The result appeared to him to be that, instead of shading these screens they ought to be placed in the most open and exposed positions possible. These comparisons were to his mind eminently satisfactory and encouraging, as showing that the main cause for dissatisfaction with this screen, based on the supposition that in very hot weather it got heated up, had no foundation in fact.

Mr. STRACHAN said he regarded the sunshine recorder as the most practical meteorological instrument invented since the Brussels Conference in 1853, and with the form introduced by Professor Stokes, not only had you an accurate and reliable instrument, but a cheap one, and with proper

care there was no reason for its failure whatever. He should rather imagine that it would give an excessive record excepting at the hours of rising and setting, because with a glass globe properly focussed the heat developed was so intense that the registration must be almost instantaneous. There was no doubt that the heat developed would amount to 2,000°, and whether the card were damp or not, it could not stand such a heat as that. The study of the distribution of sunshine was very interesting, and, so far as his own investigation had gone, it had impressed him with surprise as to the anomalous distribution; the east of England seemed to have the most, next the south-west, and next the south of Ireland; therefore it was quite clear that if those instruments were properly worked records might be obtained which would be of very great importance. An objection had been taken to the stations, that some of them were too much crowded together, and it had been said before now that meteorology was heaping up millions of figures, most of which were and would be useless. Considering that some of the stations were so close together as Southbourne and Bournemouth, and even Westbourne, within a mile or two of each other, the conclusion could not be avoided that a large amount of superfluous work was being done, but at the same time there was a meteorological difference between those two stations. Some doctors stated that Bournemouth was relaxing, and that might be true with regard to one part of Bournemouth, but it could not be true of the Westbourne district. These little distinctions when understood would determine the localities where physicians should send their patients, and the difference of a mile or two would determine whether a place was bracing or relaxing, there being very often a great difference within a short distance. Then came the question of the distribution of rain, and the differences on the English coast were very surprising, and along the coast of Cornwall and Devonshire there was a very heavy rainfall, but when you got up to Bournemouth you found the rainfall dropped from 50 inches to below 30. These discrepancies came out as

the result of an enormous number of observations, and if that amount of work done could be classified so as to bring out the salient points and save the multiplication of figures, he thought the results would be more generally useful.

Mr. CHARLES HARDING said he had listened to both these papers with great interest. He did not quite agree with Mr. Strachan that they had too many figures. Undoubtedly they had stored up a great quantity, but what was wanted was an army of doctors, like Dr. Mann, to discuss these figures which had been collected. He was much struck by the remark of Dr. Mann, that the public generally, and even those people specially interested, would not inquire sufficiently into the meaning of diagrams and maps placed before them; they looked at them, and if they did not see the meaning immediately they passed on, whereas, if they would only give five or ten minutes' careful study, they would find there was nothing beyond their grasp, but for want of that they went on in blissful ignorance for the whole of their lives on the most simple points. The map of climatological stations might strike one as giving a great number somewhat close together, but he agreed with Mr. Symons with regard to the south coast, that the stations were by far too few. Mr. Strachan had alluded to places, such as Bournemouth, where there were two close together, but he could readily believe that at such a place as Hastings, and many others where there were hills in the vicinity, a great difference might exist between the climate of one spot and another only a mile distant, because the hills would materially affect the temperature. To give one instance of radiation at night. The cooling down of the earth would cool the layer of air in contact with it, and if there were not much wind blowing that layer would roll down the hill-side. Many people supposed that you had a colder air at the top of the hills, which was a great mistake; you had really colder air at the lower part of the hill, due to this nocturnal radiation. There were many other instances which would readily suggest themselves, showing how the lie of the land might influence the

temperature, and the winds. Memory was proverbially treacherous, and he would not attempt to go over the ground which Dr. Tripe had traversed, with regard to the influence of temperature on health, but he should like to refer to last year, when there was a mild winter and a cool summer—an absence of extreme temperature, which was favourable to health. In the winter the deaths from respiratory disease were far below the average; March was extremely cold, about 6° below the average, and it would be found that in April and May the deaths from disease of the respiratory organs were excessively large, but that was only just after that extremely low temperature. Again, in the summer, there was a cool temperature, and therefore a low death-rate from scarlet-fever and other zymotic diseases. Another point, which was extremely interesting, was the almost entire absence of small-pox at the early part of the year. Small-pox gave its maximum about May or June, and decreased in a marked manner when the temperature increased, so that you may calculate on its being nearly stamped out in the hot summer weather. But this year the conditions were altogether different. There was almost an epidemic of small-pox, the deaths being over the average, though apparently with somewhat different conditions of weather to last year, though perhaps if it were inquired into more minutely it would be found there were conditions existing now which did not exist then. Last year on the whole the deaths in London were about 7 per cent. below the average; from zymotic diseases they were about 23 per cent. below the average; and from diseases of the respiratory organs 11 per cent. Fog, of course, was an important factor in diseases of the respiratory organs, and we have been very free from that lately. On the other hand, it must be remembered, that though a cold winter increased the death-rate in some respects, if you had cold weather you usually had a quiet winter, and if you had a warm winter it was usually stormy; so that though it might be favourable to health on land it promoted deaths from shipwreck. With regard to the sense of nausea in

balloon ascents, no doubt Mr. Scott was right when he attributed that feeling to the swaying motion of a captive balloon, but he did not think that was the whole cause of it. There were cases of nausea when there was a free ascent to very great heights. He had not experienced it himself, as he had not been higher than three miles, but he believed it was greatly attributable to the escape of gas, which always went on when the balloon was rising rapidly, and that might very possibly give rise to this feeling of nausea.

Mr. WILSON said the effect of rarefied air was very beneficial in cases of brain fatigue. He had found that staying at Braemar, or in the Alps, had a very good effect. Now, there were at Malvern, and other places, chambers for compressed air, which were very useful in some diseases, and he would suggest whether they could not have exhausted air-chambers to relieve brain discomfort without having to go to the Alps.

Mr. SPARKS observed that a complete record of sunshine observations would be of very great value, especially to those engaged in farming operations. In his opinion, however, a cold winter and a hot summer were best, both for the crops and animals.

Professor MATTHEW HAY wished to refer especially to one point mentioned by Dr. Tripe, namely, the influence of ground water on health. This matter had not received much attention yet in this country, but in Bavaria it had been worked out under the able superintendence of Professor Pettenkofer, one of the foremost leaders in hygienic science in Europe. He had made innumerable and constant observations from day to day on the height of the ground water of Munich, and found that when the ground water fell mortality rose, especially that due to typhoid fever, he thought, therefore, it was highly necessary that similar observations should be made in England. He had recently the opportunity of speaking to Professor Pettenkofer on the matter, and found he attached so much importance to the height of ground water as an indication of the climatology of Munich, that although for the past month

it was excessively low, and, therefore, typhoid might be expected, yet very recently it had been rising rapidly, and from that he felt certain that the typhoid mortality would sink, and not only that, but if it continued to rise there was hardly any chance of cholera taking place in Munich. He said that he observed three important epidemics of cholera in Munich, and when the ground water rose the cholera disappeared, or if the epidemic chanced to be in Europe at the time when the ground water of Munich was high it never reached there or took root. The ground water probably was merely an indication of the rainfall; a correct measure of the amount of water which fell and penetrated through the soil, and in so doing acted upon it in a particular manner. It was the only correct measure we had of the amount of rain which actually passed through the soil; that which evaporated was practically of little or no consequence in connection with health.

Mr. BALDWIN LATHAM said he had been tabulating for a number of years observations of ground water in this country at a great number of stations, and he could say with absolute certainty that in those districts where the observations were going on, when they were within ten days or a fortnight of an epidemic of typhoid fever. It was not a question of whether it could be done, for it had been done, and he could refer to sanitary authorities to whom he had communicated the information he had received, and who on that information had issued placards cautioning the people as to the steps to be taken. There could not be the slightest doubt about this question of underground water having a direct bearing on the public health, and it would be found on studying the statistics of all zymotic diseases, excepting diarrhœa, that almost all of them followed percolation. Diseases were rife during the time of percolation, but as the water passed through the ground the disease declined. It was not the lowness of the water which caused typhoid fever, but the lowness of the water was the measure of the intensity with which the disease would follow that period of lowness. It was clear

from the observations made by the celebrated German biologist that it was absolutely essential before typhoid fever could break out that a certain degree of development of the poison must occur in the ground, and after that development had taken place the first rains which passed through the subsoil water would give typhoid. That was because the water passing into the ground drove the ground air out. This question, therefore, was intimately connected with the construction of a house; and it was most essential from a sanitary point of view that some means should be taken to cut off, especially in districts where the whole soil had been fouled for generations, all communication between the soil and the house. If that were done, one of the great sources of typhoid and other diseases would disappear. Diarrhœa was entirely to his mind a question of the temperature of the drinking water. He had been for years in various places carrying on observations on this question, and it was not until the temperature of drinking water rose over 60° that diarrhœa became prevalent. The temperature was above that point now in London, and diarrhœa was becoming prevalent. In some country districts which drew their water supplies even from the most impure sources, if the water remained cold throughout the year they did not get these epidemics. No doubt cases of diarrhœa did occur, but they were more akin to mild typhoid fever. It was a remarkable fact that diarrhœa as a disease in this country was never epidemic until the pipe-system of water supply was introduced. That water, of course, although it might come from a well, and be perfectly cold at the source, before it got through the mains was heated up, and in the majority of cases the temperature was very high. Greenwich and Woolwich drew their supply from the wells, the temperature of which never exceeded 52°, but it was not at all uncommon in the summer time for the water to be supplied direct from the mains at 66° or even over. There was a marked difference between epidemics of diarrhœa in districts supplied by the Kent Company and those supplied from

the Thames. In the latter case the water got warm at its source before even the ground got warm at the depth of the main, which was usually about 3 feet, and the result was that where diarrhœa became epidemic in districts supplied from the Thames, and River Lea, the Kent districts were only just beginning to feel the effects; but a fortnight later it followed into those districts, and practically at the end of the year the death-rates from diarrhœa were almost identical. His own opinion was that a great deal more attention would have to be paid to these questions of meteorology and disease, and he only wished that a few more medical officers took as much interest in the matter as Dr. Tripe did. A short time ago he had prepared a diagram showing the connection between low ground water and typhoid fever in the case of Croydon, the observation extending from 1866 to the present time, and showing a very marked connection between the two.

The Rev. F. GILBERT WHITE said he had been an observer of meteorology all his life, and so was his father before him. One thing he had observed quite agreed with what Mr. Latham had just said; wherever people would make a rain-water reservoir underground covered over, which he did on the top of Dartmoor, they would be able to have the water cold; there was always a cold dew on the jug and tumblers in which it was used. Not being aware of this theory before, he had not taken any observations with regard to this rain-water tank, but he was quite certain that a great mistake was made throughout the country generally in not taking means to store the rain-water. People would lower their wells, and in many cases ruin their water, because they got dry, whereas for the same outlay they could make a reservoir underground holding 3,000 or 4,000 gallons, and never need run short. There was a great deal of prejudice against rain water, which was quite unfounded. Some people said it might be all right if it were filtered, but he thought that if it were filtered you ran the risk of spoiling it. In Bermuda every one drank water from reservoirs, one of which was attached to each house.

The CHAIRMAN observed that what had been said in the course of discussion went far to show that his introductory remarks had some truth in them. No one would go away without feeling the important connection between Meteorology and Health, but they must all agree that these studies should go on absolutely *pari passu*, in fact it seemed to him impossible to separate the two subjects. From Mr. Latham's observations with reference to the epidemic at Croydon, it appeared that they not only had to consider the question of temperature so far as the surface of the ground and the air were concerned, but that they must really go below the surface, and deal not only with the temperature of the planet as a whole, not merely climatologically with reference to each particular part of the surface, but also take into account the temperature of the underlying soil and water as well. It was perfectly clear that the sunshine recorder was a very valuable adjunct to the old instruments which had been in use for many years. Personally he should like to see something in addition to that; whether meteorologists would think it possible or practicable he did not know, but there were a great many facts which tended to show that it was important to be able in some way to separate the function of the blue solar radiation from that of the red. Now the sunshine recorder simply dealt with the red rays, which probably was the reason why several gentlemen seemed to hold rather different opinions with regard to it. You could get definite absorption of the red rays by aqueous vapour or by cloud in particular states, and probably that fact would reconcile some of the observations which had been made. Passing to the barometer, they had had several excursions based on Dr. Tripe's remark that at the normal pressure the barometric effect on the human frame was absolutely negligible, but with regard to the effect of some considerable reduction in the pressure, as for instance in going up in balloons, there was one little piece of experience he had in America which might throw some light on the subject. It was well known to the guards on the

Union Pacific Railway, that when the train arrived at Summit Station, which was over 8,000 feet in altitude, there was frequently a great deal of malaise amongst the passengers. He had suffered from it himself, and had been a long time away from the gay delights of London, and had suffered no fatigue, having been three days in a railway carriage. So that on that point there was probably something still to be learnt. They were all much obliged to Mr. Symons for the trouble he was taking with regard to the establishment of meteorological stations, and also to those gentlemen who had endeavoured to throw some light on the best kind of observations to be made. It did seem to him very remarkable that in localities which depended for their well-being on having a favorable reputation, so little trouble was taken to show what very favorable localities they were. Some of the first amongst those places were those that had the least rainfall, and a great amount of sunshine, and probably if those who were most interested in the success of those places knew a little more about meteorology, we might have had a flood of information from them many years ago, which would have done both them and science a great deal of good. General Strachey had recently thrown out the idea that it might be a good thing in some cases to shield the thermometer from any effect of direct radiation, so as to be perfectly certain that it registered simply the temperature of the circumambient air, and he, therefore, suggested that some thermometer bulbs should be covered by a very brilliant reflecting surface of silver. It had been found that when they were exposed in that way at equal distances from radiating surfaces there was what fine thermometer readers would call a considerable difference in the temperature record. Every one must hope that the time would soon come when superfluous work in meteorology should be separated from that which was of the highest importance. To arrive at any decision on this point, it would be necessary to have such discussions as they had had that day, and he would conclude by expressing a hope that long after that Exhibition

had ended there might be some means provided for dealing with matters of health and meteorology in a much closer connection than they were at present. If anything of that kind could be brought about it would amply justify the time they had given to this discussion.

A vote of thanks to the Chairman, moved by Mr. H. SOUTHALL and seconded by Mr. BALDWIN LATHAM, having been carried unanimously, the Conference adjourned till to-morrow.

Conference on Friday, July 18, 1884.

This Conference resumed its Sitting on July 18th,
Dr. J. H. Gilbert, F.R.S., in the Chair.

3. "*The Equinoctial Gales—Do they occur in the British Isles?*" By Robert H. Scott, M.A., F.R.S.
4. "*Some Occasional Winds and their Influence on Health.*" By William Marriott, F.R. Met. Soc.
5. "*Cumulative Temperature.*" By Robert H. Scott, M.A., F.R.S.

"THE EQUINOCTIAL GALES—DO THEY OCCUR IN THE BRITISH ISLES?"

By Robert H. Scott, M.A., F.R.S.,
President of the Royal Meteorological Society.

Most scientific meteorologists are disposed to give up, almost in despair, the idea of eradicating from the popular mind the belief in the influence of the moon on the weather. There is, however, another belief, not quite so widely spread, but still very generally accepted, which attributes to the equinoxes a peculiarly stormy character. Over and over again have I heard the remark that it would be well for those proposing to take a voyage to wait until the equinoctial gales were over. It has struck me, therefore, that as we have had for several years past a regular system of storm warnings, it might be of interest to ascertain if the record of these warnings, and of the storms with which they

were connected, exhibited any maximum of storm frequency about the equinoxes.

The period I have taken has been that of the fourteen years, beginning with the spring of 1870, and I have commenced with the spring in order to include the past winter, that of 1883–4. With the year 1870, the systematic checking of storm warnings was commenced on the demand of the late Colonel Sykes. The results were published as "Parliamentary Papers" for the first seven years, and subsequently the returns have been regularly prepared in the Meteorological Office, though only the summary of results have appeared in the Annual Reports. As these returns give not only the storms for which warnings were issued, but also those for which none were sent out, they afford a ready index to the storms which have been felt on the coasts.

Only such storms have been selected as have been really severe, such as have attained force 9 of the Beaufort Scale at more than two stations, with a velocity exceeding 50 miles an hour recorded by an anemograph for more than a single hour. I have also not discriminated between the directions from which the strongest winds were felt.

The whole enquiry has been of a somewhat cursory nature. From its very character it does not admit of great accuracy; firstly, because the personal equation of the storm-reporters, such as lighthouse officials, is strongly marked—some of them reporting force 12 rather frequently! —and secondly, because the area with which we have to deal is too limited to be a fair gauge of the disturbances of the atmosphere at large. If a severe gale passes either over Spain or just outside the Shetland Islands, we shall have no record of it at our own stations.

In all questions of the periodicity of gales this difficulty crops up. Speaking of the general circulation of the atmosphere over the Atlantic, the fact that a gale does not affect these islands is no proof that it has not passed the meridian of Greenwich, either north or south of us. It would appear, and this we shall probably be able to

demonstrate by our forthcoming Atlantic Weather Maps, that hardly a day passes when there is not a storm over some part of the Atlantic. The very time that we have had a dead calm, in an anti-cyclone over the British Isles, is the period at which the cyclonic storms strike the coast of Norway, north of the sixtieth parallel. In fact, the anti-cyclones are always accompanied by cyclonic depressions.

The mode of enquiry adopted has been to take fifteen-day periods (that is, to take seven days on each side of the two Equinoxes), and to divide the year into equal intervals of this length. Of course we have had twenty-four such spaces, with a remainder of five days, which have been omitted at the beginning of July, at the calmest part of the year.

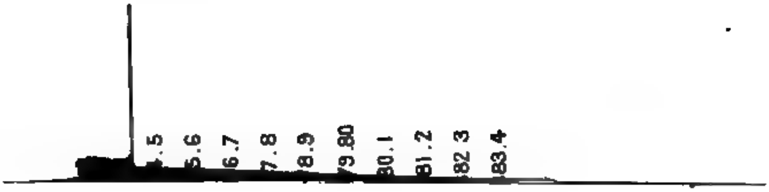
There are represented on the diagram the dates of the several storms, and a curve is also given showing the march of frequency in the fifteen day periods.

These show that the storms are all but exclusively confined to the winter half year, if we take that to include part of the autumn and spring.

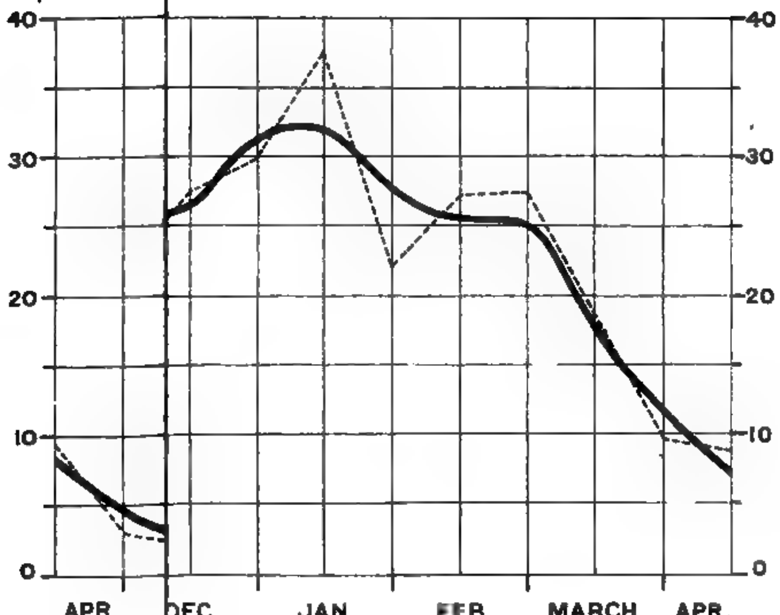
A glance at the large diagram will show how for a certain interval the stream of storm depressions sets over us, and then for a time takes another path, leaving us at rest. In some years we have as many as four or five storms in a fifteen-day period, and in others we have none, or only one. This happens even in the latter half of January, the stormiest period of all.

The diagrams show that there is no strongly-marked maximum at either equinox, but they do exhibit indications of periodicity which are very interesting.

Leaving the summer alone, as not worth notice, the frequency rises from nine and eight in the periods preceding the autumn equinox to ten at that epoch. The curve then rises rapidly, the value doubling itself and trebling itself in the two succeeding intervals. We then find a falling off at the time of the Martinmas summer in the first half of November, and a second maximum in

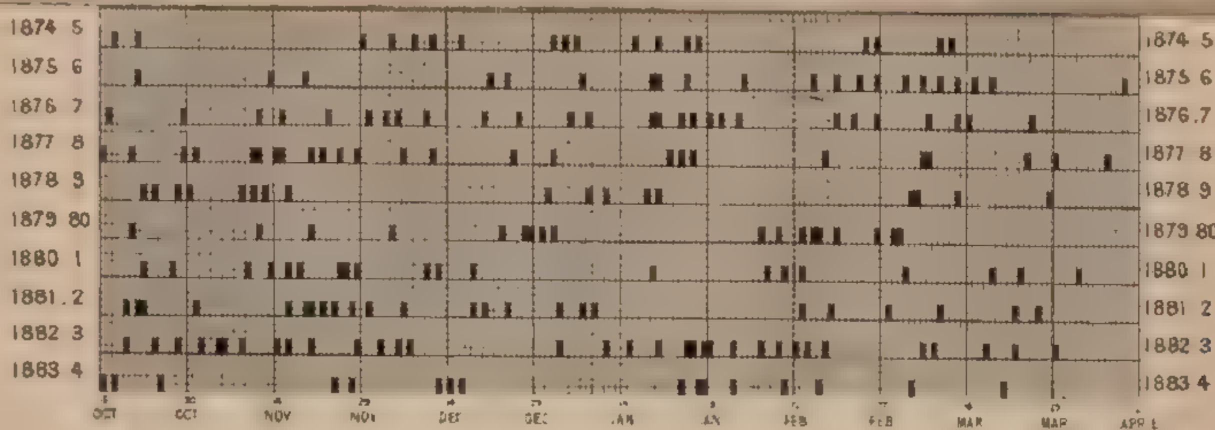

5.6
6.7
7.8
8.9
79.80
80.1
81.2
82.3
83.4

TORMS.


40
30
20
10
0
APR.
DEC.
JAN.
FEB.
MARCH
APR.

STORMS IN THE BRITISH ISLES

APRIL 13TH 1870 —— APRIL 2TH 1884



the end of that month—the period indicated by Sir John Herschel long ago, in an article in 'Good Words' for January, 1864, as that succeeding what he called "The Great November wave," a phenomenon which does not receive as much attention now as formerly. The first part of December is comparatively quiet, but after that, the frequency rises to its absolute maximum at the latter half of January, from which period the curve descends gradually, with one decided check in February, to the same value which it had in August, and which it attains at the end of April. The check in February reminds us of the well-known tradition of the "Halcyon" days at the end of winter. The frequency at the Spring Equinoctial period is nearly double what it is at the corresponding interval at the Autumn Equinox, being 19 as compared with 10. In one particular, however, the phenomena agree, the Equinoxes are periods of sudden change in storm frequency. In the autumn this rises from 10 to 20 as soon as the Equinox is passed ; in the spring it falls from 27 to 19 as the Equinox arrives. Accordingly, persons who wait till the Equinox is passed in autumn, improve their chances of falling in with a storm, for the diagram shows no signs of a lull once a heavy storm has occurred. In the spring it would apparently be wise to wait till April was well advanced, if you wished to get calm weather in the Bay of Biscay.

If we now look to see what evidence of recurrence of storms, for particular short periods, is discoverable in our data, we find that the day most frequently so distinguished is January 1st, on which a storm was recorded six times in the fourteen years. This is very remarkable, as December 31st only shows one, and January 2nd only two storms.

Five days, November 10th and 20th, January 18th and 19th, and February 26th, show five each, and no less than sixteen days show four.

The stormiest two-day interval is that of January 18th and 19th, which, as just explained, exhibits five storms each. The most disturbed three-day period is that of

January 24th to 26th, where we find four storms on each day.

The date of the battle of Trafalgar, October 21st, is marked by two fours, on the 21st and 22nd, but the end of October is not so disturbed as the end of January.

The diagram also shows that almost every month in the year is occasionally nearly free from storms. October, November, December, and January have only one apiece, but in different years. March is the only month which has at least, two storms, thus justifying its epithet, "March many-weathers."

In conclusion, I may say that I am not the first who has attacked the notion that equinoctial gales were felt in Northern Europe. Dove, in the 4th edition of his 'Gesetz der Sturme,' 1873, at p. 197, speaking of storms arising outside the Trade Wind zone, says:

"In Western Europe these storms are rare, and probably are never experienced in summer; we must now examine into the reason of this, and must take care to remember the changes in atmospherical conditions which occur in spring and autumn. Lucretius calls these epochs "the Wartime of the Year," and in fact an Italian may well speak of equinoctial storms. Such an expression, however, sounds strange from the mouth of a German, for one cannot but think that he puts the equinox at Christmas, and forgets that September is the usual month for the occurrence of that phenomenon."

The tables which are appended to the paper exhibit :—

I. The actual dates of the storms.

II. The diurnal frequency during the period.

III. The frequency in fifteen-day periods, and the same smoothed by the usual formula $B = \frac{a + 2b + c}{4}$

TABLE I.—Dates of Storms. (*The year begins with April 13th.*)

Month	1870–1	1871–2	1872–3	1873–4	1874–5	1875–6	1876–7	1877–8	1878–9	1879–80	1880–1	1881–2	1882–3	1883–4
April	..	..	21	..	..	..	14	16	16, 21	14	18, 21	..	..	17, 30
May	12	..	4	..	..	..	..	..	19	..	..	16	..	..
June	..	..	..	..	..	..	..	1, 5	..	27	..	..	..	..
July	..	..	..	..	..	..	..	..	..	1, 20	..	..	..	..
August	..	24	..	28	..	..	2, 31	25	30	25, 27, 28	..	26	23	..
September	4, 9	27	24, 27	..	21	24, 27	30	13	15, 18	3, 22	14	..	2	1, 26
October	12, 15, 18, 23	1, 21, 27, 28	10, 23, 29	6, 10, 20, 22	3, 6, 9, 17, 21	6, 21	11, 16, 29	10, 13, 15, 20, 29, 31	7, 10, 22, 24, 28, 30	20	5, 7, 22, 27	14, 19, 21, 22, 31	1, 19, 24, 28	4, 15, 17, 25
November	10, 22	20	1, 6, 10, 23, 25	1, 10, 22, 27, 29	29	13, 19	11, 15, 23, 30	10, 11, 14, 15, 20, 22, 25, 28	8, 10, 12, 16	11, 20	9, 13, 16, 18, 25, 26, 28	16, 19, 20, 22, 24, 27, 30	1, 4, 5, 8, 14, 16, 20, 28	24, 27
December	22, 24	18, 20, 28	8, 16, 20, 22, 24, 27	16, 21, 29	4, 8, 11, 16	21, 24	3, 5, 10, 20, 26	6, 11, 25	31	4, 23, 27, 28, 30	10, 12, 18	6, 18, 20, 24	2, 5, 7	12, 14, 16
January	6, 10, 15, 16, 31	1, 3, 4, 5, 13, 17, 24, 25, 31	1, 4, 6, 8, 13, 18, 22, 26	1, 4, 8, 18, 20, 26	1, 3, 5, 15, 19, 24, 26	6, 18, 19, 24	4, 7, 18, 19, 23, 25, 28, 30	1, 21, 23, 25	7, 10, 17, 19	1	18	2, 6, 8	2, 10, 14, 19, 24, 25, 27, 28	23, 26, 27
February	5, 10, 12, 21, 23	1, 3, 12	2	10, 26, 28	24, 26	3, 15, 19, 23, 26	2, 1[illegible], 22, [illegible]6	17	..	6, 9, 13, 15, 16, 19, 26	7, 10, 13	13, 18, 28	1, 6, 9, 12, 14, 17	1, 10, 16
March	6, 7, 9, 12, 15	18, 28	10, 15	19, 27, 29	9, 11	3, 6, 9, 12, 15, 18	7, 12, 14, 25	6, 7, 24, 29	4, 5, 12, 28	1, 2	3, 18, 23	9, 22, 26	6, 8, 17, 22, 29	4, 20
April	..	3	..	1, 2, 12	..	10	..	7	..	..	2	..	..	..
Totals	26	25	29	28	22	24	31	32	25	27	25	27	36	21

TABLE II.

Diurnal Frequency.

Date.	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	6	3	1	1	..	1	1	..	1	2	3	..
2	2	2	1	2	..	..	..	1	1	..	..	1
3	2	2	2	1	..	..	..	..	1	1	..	1
4	4	..	2	..	1	..	..	..	1	1	1	2
5	1	1	1	..	..	1	..	..	..	1	1	2
6	4	[illegible]	4	..	..	..	..	..	..	3	1	2
7	2	1	3	1	..	..	..	..	..	2	..	1
8	1	..	1	..	..	..	—	..	—	..	2	2
9	..	2	4	..	..	..	..	..	1	1	1	..
10	3	4	1	1	..	..	..	—	..	4	5	2
11	..	..	1	..	..	—	..	..	..	1	3	2
12	..	3	4	1	1	..	..	..	..	1	1	2
13	2	3	..	..	..	..	..	..	1	1	2	..
14	1	1	1	2	..	..	..	..	1	1	2	1
15	2	2	3	..	..	..	..	..	1	3	2	..
16	1	2	..	2	1	..	..	..	..	1	4	4
17	2	2	1	1	..	..	..	..	..	2	..	..
18	5	1	3	1	..	..	..	—	1	1	1	3
19	5	3	1	..	1	..	..	..	..	2	2	..
20	1	..	1	..	..	..	1	..	..	3	5	4
21	1	1	..	3	..	..	..	..	1	4	..	2
22	1	1	2	..	..	..	..	..	1	4	4	2
23	3	2	1	..	..	..	..	1	..	2	2	1
24	4	1	1	..	..	..	..	1	2	2	2	4
25	[illegible]	..	..	..	..	..	..	2	..	1	3	1
26	4	5	..	..	..	..	..	1	1	..	1	1
27	2	..	1	..	..	1	..	1	3	2	3	2
28	2	2	2	..	..	..	..	2	..	3	3	2
29	..	..	3	..	..	..	..	..	..	3	2	1
30	1	..	..	1	..	..	..	1	1	1	2	1
31	2	..	..	..	..	..	..	1	..	2	..	1

TABLE III.

FIFTEEN-DAY PERIODS.

Period.	No. of Storms.	Smoothed $\left(B = \frac{a+2b+c}{4}\right)$
April 13 to April 27 .	9	7·75
April 28 „ May 12 .	3	4·25
May 13 „ May 27 .	2	2·25
May 28 „ June 11 .	2	1·5
June 12 „ June 26 .	0	0·5
July 2 „ July 16 .	0	0·25
July 17 „ July 31 .	1	0·75
Aug. 1 „ Aug. 15 .	1	3·0
Aug. 16 „ Aug. 30 .	9	6·75
Aug. 31 „ Sept. 14 .	8	8·75
Sept. 15 „ Sept. 29 .	10	12·0
Sept. 30 „ Oct. 14 .	20	20·75
Oct. 15 „ Oct. 29 .	33	27·25
Oct. 30 „ Nov. 13 .	23	28·25
Nov. 14 „ Nov. 28 .	34	28·0
Nov. 29 „ Dec. 13 .	21	25·75
Dec. 14 „ Dec. 28 .	27	26·25
Dec. 29 „ Jan. 12 .	30	31·25
Jan. 13 „ Jan. 27 .	38	32·0
Jan. 28 „ Feb. 11 .	22	27·5
Feb. 12 „ Feb. 26 .	27	25·75
Feb. 27 „ March 13 .	27	25·0
March 14 „ March 28 .	19	18·75
March 29 „ April 12 .	10	12·0

DISCUSSION.

Dr. MANN said no doubt this paper presented a substantial truth, and that the notion that storms occurred at the equinox, perhaps, was entirely without foundation. He had thought so for a long time himself, but the idea he had was, that the storms followed the equinoxes. It was quite clear that the cause of these storms must be looked for in the varying conditions of temperature, and they were much indebted to Mr. Scott for having so clearly and definitely placed the issue before them, and he hoped he would continue his labours, and be able to make public his further conclusions.

Mr. G. J. SYMONS, F.R.S., said he felt rather unhappy at the overthrow of the old-fashioned theory with regard to equinoctial gales, and he could not quite consent to its burial in spite of the overwhelming evidence Mr. Scott had brought forward. He thought he could, perhaps, see a reason why the theory had been supported, and why the general impression got abroad, for he did not believe that any of these old adages existed without some foundation in fact. He suspected the solution of this question was traceable to the question of the character of the storms rather than to the question of their intensity. Some few years back Mr. Glashier reduced the observations which had been made at the Royal Horticultural Gardens, at Chiswick, during a period of something like half a century, and amongst the values he got, was the daily rainfall during that time. Subsequently the Greenwich observations were discussed in a similar way, and subsequently to that one, a very long register which had been kept by Miss Molesworth, at Cobham, was discussed ; and eventually, Mr. Dines, who was living in that neighbourhood, discussed the Chiswick, Cobham, and Greenwich registers, and the result of the whole was to show that the last week in October was the wettest period of the year. It was just possible that a reconciliation of Mr. Scott's facts with the Greenwich

notions might lie partly in the wetness of the gales, and partly in the remark which fell from Dr. Mann, which he quite agreed in, that these gales came not at the date of the equinox, but two or three weeks afterwards. It had been said for every theory there must be some substratum of fact, and the substratum of fact for this theory, he thought, lay in the idea that the periodical storms came as a rule from the West Indies or the Gulf of Mexico, and took a certain number of days to come across. Now, if the equinox were to have any effect at all, it might be presumed that it would be chiefly in the tropics, and if the effect was generated in the Gulf of Mexico, it would certainly take some little time before it reached our shores. There was plenty of vapour in that locality to account for the heavy rains which characterised the last week in October when the storms reached here. Whether these different points could be got together to account for the old adage he could not say, but his own impression was a popular notion of this sort had always some kind of foundation. There was an old saying, namely, "February fill dyke," which seemed difficult to account for, when, looking into statistics it was found that February was the very driest month in the year; but on further investigation the complete proverb was found to be "February fill dyke, be it black, or be it white," and the explanation finally suggested was, that February was a month in which a good deal of snow usually occurred, when the dykes got full of snow, although that might yield only a comparatively small quantity of water.

Dr. TRIPE agreed with Mr. Symons that there was something in all these old adages, but he thought neither Mr. Symons nor Mr. Scott had looked quite far enough back for the origin of this belief. Many years ago there was a great cry that Parliament had taken away eleven days—in other words, the almanac time was altered; consequently the period of the equinox was altered likewise. He could not but think that this adage, which was very old, and this belief in the occurrence of storms at the

equinox, was far older than the Act of Parliament which took away so many days, and must date from a time when it was probably true; because throwing the equinox over from the latter part of September into October brought one much nearer to the storm period. Of course, in such matters, you could not expect people to be exactly scientific, and very likely many of the persons present in that room would be hardly able to say, off-hand, on what date the equinox occurred; much less could you expect the poor people, amongst whom these adages generally took their rise, to be particular, within a day or two, to the precise time of the equinox. When a change took place from a period of quiescence to a period of storm, even in the case of a man's circumstances, they were apt to forget the state of things just before the change, but the change itself made a strong impression on the memory; and this change from quiet to stormy weather, which did occur at about the time of the equinox in the old style, would be sufficient to account for the adage. He was sorry to say that the progress of science was removing many old beliefs, and this one would have to follow; but he thought the eleven days had hardly been taken sufficient notice of.

Mr. LAUGHTON could not agree with Dr. Tripe that the almanac explained the matter, as he had suggested. Although it might lessen the difficulty with regard to the autumn equinox; in the spring it would make matters rather worse. He should rather look for the origin of the fable, for such it was as far as England was concerned, in the adoption of some popular saying for other countries. As much of our scientific learning came from the Mediterranean, or from Italy, very probably if they could look back into old Italian and Roman history, they would find that severe gales had occurred about the equinox, which perhaps had buried their fleets by hundreds at a time, and that the memory of those disasters had lived long in popular memory in Italy, and had been transferred to England. There seemed absolutely no reason, taking historical gales in this country, to refer them to the equi-

noxes, or to suppose that anything had occurred here to give rise to such a notion.

Mr. R. H. SCOTT, in reply to a question, said by an equinoctial gale he meant a gale within seven days on either side of the equinox.

The CHAIRMAN, in proposing a vote of thanks to Mr. Scott, said be had shown that at any rate the period of heaviest storms came pretty soon after the equinox in the autumn, whilst in the spring it preceded it. He did not know, however, whether a record of fourteen years was quite sufficient to draw a positive conclusion from.

Mr. SOUTHALL asked whether it would not have been as well to adopt rather a lower standard than force nine of the Beaufort scale for the summer months. There might be especially windy periods in the summer, although they might not come up to the intensity represented by that figure.

Mr. SCOTT, in reply, said he had pointed out in the Paper that the equinoxes were periods of change, and that immediately after the equinox, about the end of October, there was a period of great frequency, and also immediately before the spring equinox. With reference to Mr. Southall's question, he did not think it fair to take a different standard for gales in summer than in winter. In summer a gale hardly ever occurred which was serious to anything except small pleasure boats, and those need hardly be considered.

SOME OCCASIONAL WINDS AND THEIR INFLUENCE ON HEALTH.

By WILLIAM MARRIOTT, F.R. Met. Soc.,

Assistant Secretary of the Royal Meteorological Society.

THE subject chosen for my paper this afternoon is not a very inviting one, and I fear will be rather dull. But as winds have a great influence upon health—for if there were no wind the atmosphere would be quite stagnant, and we

should perish—it may not be unprofitable to turn our attention for a short time to the peculiarities of certain occasional winds.

The earth is surrounded by a thin film of air called the atmosphere. The air allows the sun's rays to pass through it without being much heated thereby; these rays fall upon and heat both land and water, which warm the air resting upon their surface. The earth gets warmed during the day, and cooled by radiation during the night; whereas the sea retains the heat it receives from the sun, and is consequently more equable in temperature than the land.

On referring to an isothermal chart of the globe for January, it will be seen that in the northern hemisphere the air, owing to radiation, is much colder over the continents than over the sea; while in July the reverse is the case. As air expands by heat and contracts by cold, warm air is lighter than cold air. If we now turn to an isobaric chart for the same months, we shall find that over those regions where the air was cold the atmospheric pressure was denser, *i.e.*, the barometer reading was higher than where the air was warm, and *vice versâ*.

All winds may be regarded as caused directly by differences of atmospheric pressure, just in the same way as the flow of water is due to difference in level. The air flows spirally outwards from a region of high pressure in the direction of the hands of a watch in the northern hemisphere, and spirally inwards in a region of low pressure in the direction opposite to that of the hands of a watch. (The movements are exactly the reverse in the southern hemisphere.) This circulation of the air has given rise to the following simple law for the northern hemisphere—known as Buys Ballot's—viz., "Stand with your back to the wind, and the barometer will be lower on your left hand than on your right." The regions of low pressure are called cyclones, and the regions of high pressure anti-cyclones; the circulation in the former being cyclonic, and in the latter the opposite to cyclonic. The intensity of the

wind in all cases depends upon the closeness of the isobars, or lines of equal pressure; for the closer the isobars the greater is the difference in pressure in a given distance, and consequently the stronger the wind.

Now it is the position and movement of these areas of high and low pressure that determine the direction of the prevailing winds. For instance, in winter, when high pressure prevails over Asia, the wind blows out from it in the direction of the hands of a watch, and comes down over India as a north-east wind. This is the North-east Monsoon, and is accompanied by fine weather. In summer, when the distribution of pressure is entirely changed, the wind blows from off the warm Indian Ocean as a south-west wind, and being highly charged with moisture, passes over India as the South-west Monsoon, producing cloud and rain.

The sun's heat is most powerful in the equatorial regions; the air is there so heated that it ascends as an upward current, and air flows in from north and south to supply its place. The winds thus produced do not, however, blow directly as north and south winds, but, owing to the rotation of the earth, as north-east and south-east winds. These are the Trade Winds. They are constant in direction and steady in force, and only vary in position a few degrees of latitude, according to the declination of the sun. The region between these two winds is called the Belt of Calms.

Having referred to the prevailing winds, we must now consider some occasional winds, which are for the most part peculiar to certain localities. It may be taken for granted that they are all the result of differences in atmospheric pressure, and the greater the difference, the more violent is the wind. These winds may be divided into two classes, viz., cold and hot. The cold winds usually occur in the winter and spring, and the hot winds in the summer or autumn. We will first consider some of the cold winds.

East Wind.—The wind most dreaded in this country is the east wind, which generally blows in the spring for several

days together. It is usually dry, cold, and very penetrating, and is well described in the old saying—

> "When the wind is in the East
> 'Tis neither good for man nor beast."

Dr. Arthur Mitchell, in a "Note on the Weather of 1867, and on some effects of East Winds," says, "Such winds blowing over a moist surface, like that, for instance, of the human body, tend to reduce the temperature of that surface to the temperature of evaporation, which in this case is much below that of the air itself. In licking up the moisture—that is, in causing its evaporation—a large amount of heat is rendered latent. This heat must be taken from something, and, in point of fact, our bodies are, and must be, almost its entire source. A cold and dry wind, therefore, cools the surface of our bodies, not simply by enveloping them in a cool medium, and warming itself by conduction at their expense. It does this of course; but, being dry as well as cold, it does it with less activity than it would if moist and cold—damp air being a better conductor than dry air. It is chiefly, however, by the other mode that dry cold winds abstract heat from our bodies,—that is, by using their heat in the conversion of moisture into vapour. The heat so used becomes latent, and is for the time being lost. It does not raise the temperature of the air in immediate contact with the body. On the contrary, that air itself, low as its temperature may be, gives up some of its heat to become latent in the vaporised moisture, and probably gives up more than it gains from our bodies by conduction, so that the temperature of the film of air actually in contact with our bodies may be, and probably is, a little lower than the temperature of the bulk. The quantity of heat which our bodies lose in this way is far from insignificant, and the loss cannot be sustained without involving extensive and important physiological actions, and without influencing the state of health. In feeble and delicate constitutions, the resources of nature prove insufficient to meet the demand made on them, and a

condition of disease then ensues" ('Journal of the Scottish Meteorological Society,' Vol. II., p. 80).

Doubtless nearly all present will remember the very cold, dry, and windy weather of March last year (1883), during a part of which bitter easterly winds prevailed, especially from the 19th to the 24th. Owing to a brisk fall of the barometer over France, an easterly gale was experienced over this country. As the temperature was low, and the air very dry, the wind was exceedingly bitter and keen, and its effect upon the human frame was very distressing. In consequence, there was a marked increase in the number of deaths referred to diseases of the respiratory organs. The Registrar-General gives the following particulars in his "Weekly Returns of Births and Deaths."

DEATHS referred to DISEASES of the RESPIRATORY ORGANS.

Week ending.	Mar. 3.	Mar. 10.	Mar. 17.	Mar. 24.	Mar. 31.	April 7.
Total	388	395	548	598	672	612
Bronchitis	..	..	349	391	417	379
Pneumonia	..	..	115	146	150	154
Diff. from Average .	−130	−106	+62	+95	+152	+129

The *Mistral* is a violent north-west wind which blows along the Gulf of Lyons. It is a very dry wind, and cold through its dryness, parching up the country, and withering the leaves of plants by its desiccating influence. It is often sufficiently strong to blow a man off his horse; and it occasionally overthrows the largest trees, and spreads desolation among the corn and vine crops. The trees generally have their branches twisted in the direction of the current; and, in the places most exposed to its blasts, screens of wood and stone are erected to protect the vines.

It chills the extremities of the body, and often induces dry pleurisy, and pneumonia in weakly persons. In consumptives it is occasionally the cause of blood-spitting. The natives generally complain of rheumatism and vague muscular pains.

The mistral is caused by atmospheric pressure being low in the Gulf of Lyons, and high in the north; it is most severe when the difference in pressure is very marked.

The *Bora* and the *Tramontana* are both cold winds, similar to the mistral. They come down from the Alps, and sweep over the Adriatic and neighbouring seas, and are bitterly cold and tempestuous.

The *Northers* or *Nortes*, which occur in the neighbourhood of the Gulf of Mexico from September to March, somewhat resemble the mistral. They are, as their name implies, northerly winds, and are remarkably dry, cold, and violent. Mr. R. Russell, in his 'North America, its Agriculture and Climate,' states that in Southern Texas, in January 1855, with a norther, the temperature fell from 81° to 18° in 41 hours; and remarks, "That such great and sudden changes are rendered still more disagreeable by the northers frequently blowing with extreme violence." With such changes of temperature as this, it is not surprising that these winds have a very pernicious effect upon health and vegetation.

The *Pampero* is a dry, cold, south-west wind, which blows with great violence across the pampas of the River Plate of South America. It is most frequent during the spring and summer, from October to January. Being in the southern hemisphere, the south is the cold point, and so south-west corresponds to north-west at this side of the equator.

Among hot winds may be mentioned the following:—

The *Scirocco*, which occurs occasionally along the North African coast, Sicily, South Italy, and neighbouring districts, is a hot south-east wind blowing from the heated Sahara. It is apparently a dry wind on the coast of Africa, but on passing over the Mediterranean it absorbs a great deal of moisture, and consequently is a hot moist wind on reaching the south of Europe. In Sicily during its continuance the thermometer sometimes rises to 110° in the shade. This wind receives a very bad character, for it withers green leaves and grapes; it rusts ironwork; it turns meat putrid;

paint put on whilst it is blowing will never set, and though not fatal to human life, it is deadly to human temper. It causes a feeling of languor and listlessness, and when it blows strongly it takes all the energy out of a person.

The scirocco of Spain is called the *Levecke*. It is very hot, dry, and dusty, and is most deleterious to health.

The *Solano* is an east wind, but it has a bad repute, for the Spanish say, "Ask no favour during the solano."

The *Harmattan*, which is felt on the west coast of Africa, is somewhat similar to the scirocco. It is a hot easterly wind, occurring during the months of December, January, and February. It comes from the hot desert of Africa, loaded with large quantities of fine dust, which are carried far out over the Atlantic and deposited upon the sails and decks of passing ships.

The *Khamsin* is the hot wind of Egypt, and is supposed to last for fifty days, hence its name. It comes as a south-west wind from the hot desert of Africa, and occurs from the end of April till June, at the commencement of the inundation of the Nile.

The *Simoom*.—In a recent paper read before the Royal Meteorological Society, Dr. H. Cook gave an account of the simoom, a deadly wind, which occasionally visits the deserts of Kutchee and Upper Scinde, in common with similarly constituted tracts of country in the East. Dr. Cook says:—

"Sudden, and singularly fatal in its effects, invisible, intangible and mysterious, it has ever been the dread of the desert traveller. So far as I am aware its nature is alike as unknown to the wild untutored inhabitants of the country of which it is a scourge, as to the European man of science. The presence of the simoom is made manifest by the sudden extinction of life, both animal and vegetable, over which its influence has extended.

"Lieutenant Pastaus mentions it briefly in his report on Shikarpoor, submitted to Government in 1840, as occurring in the district of Kutchee. At the close of the hot weather in 1856 a party of five men were crossing the Put of

Shikarpoor, being on their way from Kandahar to that city; the blast unfortunately crossed their path, killed three of them and disabled the remaining two.

"In the year 1851, during one of the hot months, some officers of the Scinde Horse were sleeping on the top of General Jacob's house at Jacobabad. They were awakened by a sensation of suffocation, and an exceedingly hot oppressive feeling in the air, while at the same time a powerful smell of sulphur pervaded the atmosphere. On the following morning a number of trees in the garden were found to be withered in a remarkable manner. It was as if a current of fire about twelve yards in breadth had passed through the garden in a straight line, singeing and destroying every green thing in its course. Entering on one side and passing out on the other, its track was as defined as the course of a river.

"The Moonshi of Major Henry Green, Honorary A.D.C. to the Governor and Political Agent at Khelat, is a native of Bogh in Kutchee, and gave the following description of the effects of one of these blasts, of which he was both an eye-witness and the sufferer. He was travelling in company with two other persons near Clulgherri, the site of a buried city in Kutchee, about seven miles south-east of Bogh. They were all mounted; when about 2 a.m. the blast struck them. He was sensible of a scorching sensation in the air like the blast of an oven, but remembers nothing further, as all three were immediately struck to the earth. They were carried to Bhag, where every attention was afforded them, and after some days of sickness they recovered. He states that such phenomena are frequent in the desert; that the hot blast is usually preceded by a cold current of air; that it destroys every green thing in its course, and is most frequently fatal to human life. That the bodies of the dead quickly decompose, their flesh is withered, of which the firmness and consistency is destroyed, so that it falls or may be plucked off from the bones: and this not after decomposition has commenced, but immediately on death taking place. The treatment

adopted by the natives is at once to wrap up the sufferer in a posteen or warm woollen clothes, and to administer a mixture of onions and pepper with the view of inducing perspiration; if this be established there is a hope of recovery.

"The current passes 'like a knife' through the air, leaving a well-defined narrow track."

In the discussion on this paper Mr. Symons stated that he remembered hearing of a curious case of a hot blast which occurred over a small district in this country some few years ago. A gentleman was walking down to his thermometer screen with the object of examining the thermometers, and had just reached the screen, when he saw the maximum thermometer rapidly go up several degrees, and at the same time he felt a severe pain at the back of his head. He immediately lay down under a tree, and after a little while, feeling better, he got up, and upon going to the thermometer screen again, noticed that close by there was a narrow path cut through the grass, plants, and trees, in which everything was killed. Mr. Symons visited the place the following year, and then saw the effects of this hot blast.

The *Hot Wind* is one of the most remarkable of the features of the climate of Australia, and is most severe in November, December, and January. Mr. H. C. Russell, in his 'Climate of New South Wales,' says:—"In character this wind is the most disagreeable known in Australia, but I cannot agree with the opinions which have been expressed of its unhealthiness. The heat is no doubt great, but it is *very dry*, and to some constitutions affords positive pleasure. The worst general effect that I have been able to trace is languor, and that would certainly be much worse with a moist wind of the same temperature. Vegetable life, however, does not escape with so little damage, and the commencement of a strong hot wind is a signal for all plants to droop; if the leaves are tender, they shrivel up as if frost-bitten, and never recover; in extreme cases, stronger plants are injured, and there is one instance on record in December

1828, where a hot wind destroyed for a space of thirty miles all the wheat on the Hunter River.

"The actual temperature of the wind varies from 80° to 110° in Sydney, but it seldom reaches 100°, and only once in twenty years has it reached 106°·9, the highest recorded temperature at the Sydney Observatory. Inland the heat is much greater, and in Central Australia, Capt. Sturt says his thermometer rose to 131° in the shade on the 21st of January, 1845. The heating effects of this wind are well known, and little protection is afforded by doors and windows, for a house rapidly heats, and it is only the greater heat outside that makes it endurable, which is manifest directly the cool 'burster' displaces it, for the house then feels like an oven."

Dr. Neumayer, formerly Director of the Melbourne Observatory, remarks of the hot wind of January 21st–22nd, 1860, that "the apples were literally roasted on the trees, where the north wind had set in." (Hann, 'Handbuch der Klimatologie,' p. 639.)

A similar wind is experienced in South Africa, with almost the same results; in fact, hot winds occur in all countries which are adjacent to deserts.

Dr. Mann informs me that "the hot winds of Natal are distressing, but they are not particularly unhealthy, because they continue to blow for such brief periods without intermission. The most unhealthy wind in Natal is that which comes from the north-east, and which blows parallel to the general run of the coast. It comes from the malarious districts around Delagoa Bay, and is accompanied by a tendency to the development of fevers of a remittent bilious type. This influence becomes more strongly marked along the coast district towards the north-eastern frontier of Natal."

The *Fohn* is a very warm and dry wind, which sometimes blows in winter in the north-eastern valleys of Switzerland. At the time this warm dry wind is blowing in the valleys of the north-east, a warm wet wind blows over the southwest of Switzerland, which precipitates its moisture in a

heavy downpour, and floods the country with rain. Mr Laughton's explanation is better than mine ('Modern Meteorology,' p. 46). He says: "When air is driven or lifted to a great height, as by being pressed up a mountain slope, the expansion of its volume causes a corresponding lowering of its temperature; and the air which approaches the mountains on the west should experience a certain definite loss of temperature whilst being lifted to the mountain-tops, the amount of which may be easily calculated by a reference to the height of the mountains and the diminution of barometric pressure. But if the air is moist, the chilling, to which it is thus subjected, condenses the vapour, causing heavy rain on the windward, that is, the western slopes. Now vapour, when turned into water, gives out a great deal of heat: the heat which it has previously absorbed, which gives it molecular energy, and which is very commonly known as latent heat; and this heat set free, warms up the surrounding air; so that the temperature at the mountain-top may be, and is, many degrees higher than, according to the calculation based on the loss of barometric pressure, it ought to be. If, now, this air, with the moisture squeezed out of it on the mountain-tops, and its temperature raised by the heat of condensation, is forced down into the valley beyond, the increase of pressure as it goes down raises the temperature by an amount depending, as before, on the height from which it has descended, and on the rise of the barometer; so that the air comes into the valley with the temperature due to the level at which it has arrived, increased by the heat conveyed to it on the mountain-tops by the condensation of vapour. The air is thus not only very hot, but relatively also very dry; that is to say, on the descent of the *föhn* the temperature rises at times to more than 80°, and the humidity sinks to about one-fourth of what the air is capable of holding."

Dr. Hann, in a paper read before the Vienna Academy in 1882, gives a discussion of the *föhn* in Bludenz, on the borders of Switzerland and the Tyrol. The most im-

portant point is that it is not caused by south-west storms in Italy, for the observations at Milan show "calm" when there was *föhn* in Bludenz. The *föhn* occurs when depressions prevail over north-west Europe. These draw down the *föhn*, but they do not necessarily cause a gale, even at Stuttgart.

Time forbids me speaking of many other winds which are peculiar to certain localities; but, in conclusion, it only remains to point out the desirability of every one, especially invalids, of fixing upon a residence that shall be sheltered or protected from cold and dry winds, which are very trying to the human constitution. There appears to be little protection from hot winds.

DISCUSSION.

Dr. MANN said he might describe his own personal experience of hot winds in South Africa. During several years whilst he resided there he kept a record of those atmospheric phenomena, and found there were twenty-six to thirty in the course of a year. The temperature of the hottest of those South African winds at any time was 97°, which was quite enough for discomfort, but it was a very dry one. As Mr. Marriott had stated as far as the districts he knew most about were concerned—the regions inland round Natal—these hot winds were not unhealthy. The reason for it seemed to be this: these hot winds always began to blow about the middle of the night, you heard the storm come on, which rose in intensity until you became conscious that the house was growing very warm. That continued, and at 9 or 10 in the morning it reached its greatest intensity, when very delicate plants would be killed, and the leaves of evergreens would droop, though after a little while they might recover. About 12 or 1 o'clock the sky, which had up to then been clear, would be covered over with heavy clouds, and in

about an hour there would be a magnificent thunderstorm, the rain pouring down in torrents for five or six hours, and from that time the temperature fell very rapidly, though the wind might continue to blow. He had seen the thermometer sink 30° in less than thirty minutes. This change of temperature was very pleasant, and prevented any unhealthiness occurring from the hot dry wind, and in fact one always welcomed these outbursts. That, no doubt, was the cause of their not being unhealthy—that they invariably occurred in such a condition of temperature that a thunderstorm followed, after which there was generally continuous rain until about the middle of the night. About 1 or 2 in the morning the clouds cleared away; and at an elevation of 2,000 feet above the sea he had seen the whole sky become entirely covered with seventh magnitude stars, which were ordinarily invisible to the naked eye; so that it looked exactly like the Milky Way seen through a telescope. After that they generally got the most delicious temperature the following morning, with a cool, pleasant sea breeze. Now and then, however, it happened that these intermittent winds recurred for three days running, but they were invariably broken by the thunderstorm in the daytime, as he had mentioned. A point of his remarks was that these hot winds were not unhealthy, because they were not continuous. The unhealthy wind there was that which came blowing along from the fever districts in the interior.

General STRACHEY, F.R.S., said with regard to Dr Cook's account of the simoom in Scinde, which had been quoted in the paper, to the best of his belief it was greatly exaggerated. Over the whole of India during April, May and June, hot winds prevailed; and, indeed, Scinde being an extremely arid country, hot winds were prevalent. But it must be remembered that Dr. Cook's meteorology was almost pre-Adamite; it was written nearly thirty years ago, when people were not very accurate in observing or in describing what they saw. As a matter of fact Scinde had been occupied by British troops, more or less, and

Native troops up to the present time; and during the occupation of Afghanistan, soldiers were constantly passing through the country from the Indus up to Quetta, but as far as he knew, although liable to sunstroke, there was no particular unhealthiness there. There was a liability to severe fever in the autumn, but that was a different thing altogether. The hot winds all over India were rather conducive to good health than to bad health. The exposure to sun and hot wind in aggravated form was liable to bring on sunstroke, but that was not merely from receiving the direct rays of the sun on the body, but the effect of heat generally, which produced a sort of apoplectic condition.

The CHAIRMAN said in New York and other parts of America sunstroke was generally developed in the night, not when the person was exposed to the direct rays of the sun.

Mr. WHIPPLE said the paper was a very interesting one, and it was very desirable to preserve in a collected form for convenient reference a description of these tropical and exceptional winds. He must confess, however, that although he was much interested in hearing an account of these occasional so-called hot blasts, he was rather sceptical as to their being the effect of wind at all. It seemed to him they had no facts, other than these travellers' stories, to lead to the belief that a current of very heated air could pass through a mass of cool air and yet retain its characteristics for some considerable distance. Of course they knew that a large quantity of air could be set in motion at a time, but there were no facts that he knew of leading them to credit the statement of a hot blast passing along a definite path only a few feet wide. If they looked at the blowing-machinery in the Exhibition, they would see an enormous current of air produced; but it soon got dissipated, and therefore he could not see how a wind could have the characteristic spoken of. There were electrical phenomena, notably globular lightning, which might produce such effects, and he was inclined to think that they must be due to some such cause. Of course it was a very common thing to attribute everything you

could not understand to electricity, but he did not make the suggestion for that reason. The paper contained a great deal of information with regard to the actual cause of the effects experienced physically from different winds, but he should like to know if it were the case that there might be really different climates within a few yards of one another? For instance, people commonly said that the air in one street was very much better than the air in another, and that, putting malarious influences aside—the air might be unwholesome in one house and excellent in another; whereas it seemed to him that the wind constantly blowing must change the air so rapidly as to prevent these great differences. The wind usually blew at the rate of from fifteen to twenty miles an hour; therefore he was unable to agree with those who said the air differed so much in two places, where, if one were to trust the meteorological data, there really could not be any trace of a radical change having taken place in the circumstances of the atmosphere.

Mr. G. J. SYMONS, F.R.S., said it was about fifteen years or more since the facts occurred which were referred to by Mr. Marriott, and he did not recollect the exact circumstances, but his impression was that they did not refer to a blast of air at all; in fact, he had not associated the phenomena with the idea of wind. There was no doubt about the fact, but only as to the explanation, and the impression he had on his own mind was rather—he did not know whether it were possible or not—that there might be a cloud of such a shape as to focus the sun's rays on one particular point. The impression he had was that of a path of heat rather than a current of air. With respect to the remarks made as to the difference between one street and the next, he believed Mr. Whipple was not present on the previous day, when the discussion rather turned on that point; and it was stated, with reference to the number of meteorological stations it was desirable to have, that in many cases, such as High Harrogate and Low Harrogate, and different parts of the borough of Hastings, two places close together, might be characterised by differences quite

as great as in other circumstances would be noticeable only at a distance of twenty miles. Take, for instance, such a town as Dover, with some houses on the cliff and some under the cliff. Those immediately below the cliffs, when the sun was shining straight upon them, and without any wind, would be something like an oven; but when the sun passed over, and the wind sprang up, the temperature would be very different indeed. He could not agree with Mr. Whipple, that there were no differences except from currents of air; in fact, one of the great reasons why there were differences in climate was, that the wind blew in one place and did not blow in another. They knew, for instance, that if they wanted to put up an anemometer to measure the current of air passing over, the great majority of towns offered no position in which they could possibly put it, simply because the wind did not get into the streets at all to sweep them out properly. If it were not wandering too far from the subject, he might mention that it had been strongly urged, with reference to the building of new streets, that it was very desirable as far as possible that the main lines of a town should coincide with the prevailing direction of the wind in that town, in order that the streets might be thoroughly "air-scavenged." Under ordinary circumstances, the velocity of wind in a town was not sufficient to counteract the effect of local circumstances on the atmosphere in it.

Mr. MARRIOTT, in reply, said he had given his authorities for the theories and statements quoted in the paper, and he was not responsible for them. With regard to the question, whether currents of air, only a few feet in width, were possible, he would remind them of the remarkable tornadoes and whirlwinds which sometimes occurred, when they heard of a forest or plantation being cut through as it were—the trees being cut down over a small area only, and the line being very sharply defined. If that were possible with a tornado, he did not see why it could not also occur with a hot wind.

CUMULATIVE TEMPERATURE.

By Robert H. Scott, M.A., F.R.S.,

President of the Royal Meteorological Society.

On the walls of the Meteorological Annexe will be found a series of diagrams, exhibiting from various districts in the United Kingdom, in a graphical form, the March of Temperature, Rainfall and Bright Sunshine, from the beginning of the present year, and also for the entire year 1881, which is reproduced for purposes of comparison.

The object of these curves is to show clearly some of the most important factors in the growth of crops. Now, as to the growth of crops, our chairman, Dr. Gilbert, F.R.S., is admittedly one of the highest living authorities, as, in conjunction with Sir J. B. Lawes, Bart., F.R.S., he has for many years conducted with scrupulous accuracy extensive investigations into this subject at the famous experimental farm of Rothamsted. Let us therefore hear what Sir J. B. Lawes and Dr. Gilbert have to say :—

"On this point we may remark that we have found the really most luxuriant and heavy crops, both of hay and of wheat, to have been very materially influenced by the characters of the winter and early spring periods,—*quantity* in both cases depending very greatly on the early development of the plant. With favourable conditions in this respect some of our very heaviest crops, both of hay and wheat, have been obtained under by no means specially favourable meteorological conditions during the period of most active above-ground growth. On the other hand, high proportion of corn to straw, which sometimes gives really high yield per acre, depends more upon the conditions of the periods of active above-ground growth and maturation. In the same way, great weight of hay sometimes depends upon the conditions of maturation rather than of luxuriance.

"It is obvious, therefore, that in discussing the relations of meteorological condition and agricultural production, it

is essential to be able to arrange the records for any selected periods of the year."

And again :—

"It is obvious that different seasons will differ almost infinitely at each succeeding period of their advance, and that, with each variation, the character of development of the plant will also vary, tending to luxuriance, or to maturation, that is, to quantity or to quality, as the case may be. Hence, only a very detailed consideration of climatic statistics, taken together with careful periodic observations in the field, can afford a really clear perception of the connection between the ever-fluctuating characters of season and the equally fluctuating characters of growth and produce. It is, in fact, the distribution of the various elements making up the season, their mutual adaptations, and their adaptation to the stage of growth of the plant, which throughout influence the tendency to produce quantity or quality. It not unfrequently happens, too, that some passing conditions, not indicated by a summary of the meteorological register, may affect the crop very strikingly, and thus the cause will be overlooked, unless careful observations be also made and the stage of progress, and tendencies of growth, of the crop itself at the time, be likewise taken into account."

Again—

"Those characters of season which are very unfavourable for land in poor condition, may be favourable to land in high condition, and *vice versâ*."

As regards the three elements represented on the diagrams, it is evident that the curves for rainfall and sunshine require but little explanation, as the successive steps of the curves show the successive weekly totals of rain or sunshine.

The case, as regards temperature is however different, and those who examine the diagrams will see that there are two curves, one ascending, the other descending; the one red, the other blue. A certain arbitrary base line is assumed, and the values are measured above or below that line.

It is proved, almost beyond a doubt, that each plant, say each individual cereal, requires a definite amount of heat to bring it to maturity. Thus, maize requires more than wheat, and wheat again more than barley or oats.

We all know that maize is not an English crop at all, and that wheat is not grown to much profit in Ireland or West of Scotland, being replaced by oats or barley. The ordinary reason assigned for these differences as to crops is that in each case the temperature is not high enough for the particular crop which has failed. If the enquirer pursues the subject further he generally finds out that his informant has no very precise idea as to how the temperature acts.

Now various investigators, and notably Boussingault and Professor Alphonse de Candolle, of Geneva, have devoted much attention to this subject, and the latter writer, in his 'Géographie Botanique,' has come to the conclusion that a certain total amount of temperature above a definite base line is necessary for plant growth, and that this amount, or as he calls it, this "sum of temperature" varies for each crop.

He found that plants, as a rule, did not begin to give indications of active vegetation until the temperature rose above 6° Cent. This temperature, 6° Cent., or, in round numbers, 42° Fahr., that is ten degrees above the freezing point, is taken as the base for all the diagrams.

Although Professor de Candolle propounded his views some years ago, yet, as recently as the year 1874, at the Agricultural Conference at Vienna, meteorologists were quite at sea as to how these sums of temperature were to be calculated.

The credit of solving this problem belongs to Lieut.-General Richard Strachey, the Chairman of the Meteorological Council. He proposes to adopt a certain unit of temperature to supply a standard for calculation, the unit being one degree continued for the unit of time, either one hour or one day, as the case may be. Such a unit may be conveniently called an hour

degree, or a day degree. The unit of time adopted for the calculations to which I am about to refer is a day, and the unit of what may be termed the effective temperature is therefore *a day degree.* A day degree therefore signifies one degree Fahr. of excess or defect of temperature above or below 42° Fahr. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours.

Now the first idea I want you to take in about these day degrees is that when we speak generally of the mean or average temperature for a day, or month, or year, we imply that the resulting temperature is the same as would be observed if the thermometer indicated this mean temperature throughout the entire period for which the mean is taken. Thus, if we were dealing with daily means, an average daily temperature of 62° Fahr., which is an ordinary temperature for a warm summer's day, would indicate twenty day degrees of temperature for that day, starting from the assumed base line of 42° Fahr., which has already been mentioned.

The first step therefore towards determining this effective temperature in day degrees resolves itself into determining as speedily and simply as possible the average temperature for the period under consideration.

We have, fortunately, to our hands, a very simple mode of arriving at the mean temperature with accuracy sufficient for our purposes. Almost all observers record the maximum and minimum temperatures once in the twenty-four hours. It is found that the half sum of these readings, the mean between them, is nearly but not exactly the average for the day. It must, of course, be understood that the instruments must be read regularly and at the same hour every day.

The next points which require attention are: whether the maximum and minimum are both above 42°, which occurs in summer, or both below that point, which occurs in winter; or, finally, whether one is above, and the other below.

In the first case all the accumulated temperature is to the good; it is all on the positive side. In the second case it is all on the negative side. The third case is the only one which presents difficulty, for when the extreme temperatures are on either side of the line of 42°, one portion of the effective temperature for the day is positive, and the other negative.

Now, General Strachey carried out a long series of calculations, based on the observed hourly temperatures at Kew Observatory, and at other stations in the United Kingdom, in order to ascertain the magnitude of the co-efficient by which the difference between either of these extreme temperatures and the base temperature (42° Fahr.) should be multiplied in order to obtain the values of the temperatures in excess or defect of 42° Fahr. expressed in day-degrees, and he found that this, *for a weekly period*, was 0°·4.

Accordingly we get the following rules:—

If the mean of the day is above 42° Fahr., we multiply the difference between the minimum and 42° by 0°·4 (four-tenths), and call this *the negative effective temperature.*

To find *the positive effective temperature* we subtract from the difference between the mean for the day and 42° the negative effective temperature just determined.

If the mean of the day is below 42° Fahr. the proceeding is similar; but we first ascertain the positive effective temperature, and subtract that from the difference between 42° Fahr. and the mean, thus obtaining the negative effective temperature.

The method of determining the effective temperature, which may briefly be called the accumulated temperature, is fully explained in a paper by General Strachey, which will appear in the forthcoming volume of the 'Quarterly Weather Report,' that for 1878. Meanwhile it is extremely interesting to examine the diagrams in the Annexe somewhat minutely, and to observe how the total accumulated temperature, say, up to July 1, is made up in very different ways in the two years, 1881 and 1884, there exhibited.

The year 1881 was very cold in the winter, and its accumulated temperature was made up in the spring and early summer. In the present year we had practically no frost, but then we had unusually cold weather at Easter and at the end of May.

The practical application of the data thus obtained as standards of comparison for the growth and ripening of various agricultural products must, of course, be left to the agriculturists, and it will be interesting to learn how far a correspondence between the character of the several crops and the accumulated temperature of the year can be established.

The measure of temperature afforded by this system of computation appears to be as well suited to supply a standard of comparison of climates for hygienic purposes as for agriculture, and the diagrams indicate in a forcible manner the characteristic differences of climate, in respect of temperature, of the portions of our islands to which they refer.

Thus it will be seen that since the 1st of January of the present year, while there have been nearly 400 day-degrees below 42° Fahr. in the north of Scotland, in the Channel Islands there have only been 9 such day-degrees; also that in the former district the day-degrees above 42° Fahr. have been only 726, as compared with 1,500 in the Channel Islands.

DISCUSSION.

The CHAIRMAN said he had been very much interested in this *résumé* of a very important subject, which he thought would have to be very much more considered than it had been of late, and much credit was due to the Chairman of the Meteorological Council, for the great care and attention he had given to the means of getting these records into a practical shape for consideration.

General STRACHEY, F.R.S., said it was very easy for those who were conversant with this subject, to take it all in on hearing the paper read, but there might be some present who had not quite followed what Mr. Scott had been saying, and therefore he would endeavour to illustrate on the black-board the method by which the results were obtained.

(He then drew a diagram, showing the curve of temperature for twenty-four hours, with lines representing the maximum, minimum, and mean, and also the temperature of 42°, which was taken as the datum, and showed the manner in which the calculations were made.)

He said the process was an extremely simple one, and the calculations also were very simple. He had worked out for Dr. Gilbert some time ago the data for 1881, and also for 1882, and he had them now for the present year, comparing the results for the south of England down to July 7th, he found that the accumulated temperature to that date was 1376°; in 1882, up to the 10th of July, it was 1403°; in 1881, up to the 4th of July, it was notably less, namely, 1100°; on the 11th of July it was 1200°. Therefore, it was decidedly less in 1881 than 1882 and 1883. To show the difference between the south of England and the north of Scotland, he might say that at the present time at the north of Scotland the accumulated temperature was 726° as compared with 1376° in the south of England. By comparing these figures it was easy to see how the total rose as you came south. For instance, on the 4th of July in 1881, in the north of Scotland the total was 751°, which corresponded to a result about five or six days earlier in the north-east of England, to about a fortnight earlier in the east, to about three or four days more in the Midlands, and to nearly three weeks earlier in the south of England; so that it gave an indication of the relative difference in time during which different parts of the country received the same quantity of heat, and probably if the thing were carried out fully it would give some sort of indication of the relative period at which the crops would ripen. They were much indebted to Dr. Gilbert for having raised the question, and

induced them to go into this subject, and also for pointing to another very important subject, namely, the moisture in the air, and the manner in which that was effective. He had been taking up that question also, and hoped before long to be able to produce diagrams analogous to the one now shown illustrating that point. He quite agreed with Dr. Gilbert that the manner in which the moisture was indicated at the present time was not to be trusted, and that something altogether different was necessary in order to judge of the effective moisture in the air.

Dr. MANN said they were much indebted to General Strachey for the mathematical calculations he had gone into, which enabled all these interesting facts to be put on a diagram which every one could understand. He had been much puzzled at first to understand it, but he saw in the course of a very little while what a marvellous power it was which enabled a few calculations with figures to be brought down to a certain result, and made available to illustrate a familiar principle. It was a remarkable illustration of the value of the diagramatic mode of treating an occult subject, and making it accessible to general intelligence.

The CHAIRMAN said Mr. Scott had referred in the paper to Boussingault, and others on the Continent, who had gone into this question. It was De Candolle who had originated the idea of making these calculations, but how far he had carried them out he had not been able to ascertain. Boussingault, who had travelled very much both on the European Continent and America, tried to calculate it with the view of determining what localities were suitable for different crops, and to illustrate it as far as wheat was concerned. He took half-a-dozen localities in South America, and four or five in Europe, but the only means he had were to take the recorded mean temperature, whatever that might mean, and the number of days which he estimated the crop took, from its appearance above the ground, to ripening, and multiply the one by the other, and thus he obtained his aggregate number of degrees of temperature recorded for the

growth of wheat. These figures were calculated, not as they were now doing from 42°, but practically from 32°, for he took all the degrees above 0° Cent., and multiplied them. His results converted into the Fahr. scale gave something considerably over 2000° record for the ripening of wheat. Hervé Mangon, in France, took another mode. He discarded all temperatures below 42°, but if the temperature exceeded 42° he took it down to 32°, and his figures came out considerably lower than those of Boussingault. Now he (the Chairman) tested some 28 years of experimental wheat growth, and taking the dates when he considered the temperature was that of fair growth, and taking it up to the date of cutting, which in one case was August 28th, he got the average of 1970° Fahr. over 42°. That was using only the mean monthly reported temperatures. For about six years they were able to take the daily temperatures, and in that case it came to 7010°. With regard to those years to which General Strachey had referred, he gave his results for 1881 and 1882 calculated by the same method, which was very much more exact as giving the ruling temperatures of the twenty-four hours. They took merely the mean temperatures as calculated in the ordinary way. In the case of 1881 General Strachey's method gave 1623°, whilst taking the recorded mean it came to 1664°. In 1882, which was a year of very much more growth in the early stages, that was to say, there was a great deal higher temperature before the date at which they commenced, whilst General Strachey's figures were 1525°, theirs taking the mean recorded temperatures were 1573°. He believed, according to the factors which General Strachey had worked out, that in the winter there was very little difference in the figures taking the mean temperatures in the ordinary way, but in the summer the ordinary mean was too high by some degrees, and the result was that in these calculations they found General Strachey's figures by the reduced mean came lower than reckoning in the rough way they had been able to do before. Now it was a very

important question to settle how far these facts would be of use or not. He had some hopes given him by General Strachey that they would be able to carry back these calculations for a number of years, so that they might be compared in characteristic years of produce, but until that was done they really could say no more than that it was exceedingly important to try how far these facts when ascertained would be of general utility or not. But he might illustrate the tendency of the thing very much in the same way as General Strachey had done. He had taken up to the end of the first week in July the amount recorded of accumulated temperatures up to the present time, and had arranged the districts in England as given by the Meteorological Office in the order of the highest; the South, 1376°; Midland Counties, 1370°; England east, 1316°; England north-east, 1085°; Scotland east, 1036°. Those were the corn-yielding districts, as they were classed in the meteorological records. Here they had by the same data $1\frac{1}{3}$ times as much effective temperature in the south, Midland and east of England as in the east of Scotland; in fact the order in which the accumulated temperatures came was really the order of harvest dates. He might say also that the order was the same for those five districts for the three preceding years. In their own district they had nearly 1400° of accumulated temperature up to the present time, and he believed that their wheat harvest, about twenty-five miles from London, would be earlier than usual, in fact he should not at all wonder if it took place before the end of the present month. Mr. Scott had quoted a statement of his own that the highest yields independently of quality, whether corn or straw, with the greatest amount of luxuriance was always after mild winters, and this was most strikingly the case up to a certain date this year, for he told several people who asked his opinion that they would have one of the heaviest crops of wheat or of hay for many years if the succeeding temperature or rainfall were favourable. Now for the Eastern, Midland and

Southern Districts, they had an excess of temperature almost from the date of last harvest up to the beginning of April, and then there were four or five weeks of very disastrous low temperature, much below the average. The result had been that in their somewhat heavy land the wheat still showed very heavy; with recent rains so heavy so that it had gone down, but the grass was on the other hand entirely checked with the long period of low temperature associated also with great dryness, so that they had poor hay harvests, but there was a promise of a very heavy wheat produce on anything like heavy lands; owing to the great deficiency of wet the light lands had been suffering, but so far as the heavy lands were concerned, the very mild winter would result in a large amount of growth. How far these breaks would interfere with anything like uniformity as to the total amount of accumulated temperature required for the individual crops they would have to find out. Then again, each plant and almost each plant function had its degree of temperature below which there was no growth, so that there was a great deal yet to study even when they got the facts. There was one other point he would refer to, though perhaps the remark would not be very welcome at the Meteorological Office. They were now receiving every week a record of the accumulated temperature for that week, and of the accumulated temperature from the beginning of the year, but to study the history of the year or history of the growth, it was necessary to post all those up week by week, and it would be very useful, therefore, that they should have attached to the returns the amount for every week of the year, so that they might fill them up as they came. They would then have the accumulated temperature excess or deficiency for every week before their eyes for the period they wished to study, and the accumulation at one view. It might be too much to ask the Office to undertake that, but it would greatly facilitate a study of the facts.

He concluded by moving a vote of thanks to Mr Scott for his paper.

Mr. R. H. SCOTT said, he had to express his extreme satisfaction that this short paper had produced very valuable remarks from General Strachey and the Chairman, who had paid so much attention to the subject.

(A vote of thanks to the Chairman, moved by Mr. GRANTHAM, and seconded by Mr. ROSTRON, terminated the proceedings.)

ORAL INSTRUCTION OF THE DEAF AND DUMB.

CONFERENCE ON MONDAY, JUNE 30th, 1884.

ORAL INSTRUCTION OF THE DEAF AND DUMB.
EDUCATION OF INCURABLY DEAF AND DUMB CHILDREN.

Conference on Monday, June 30, 1884.

ORAL INSTRUCTION OF THE DEAF AND DUMB.

A Conference on the above subject under the auspices of the Association for the Oral Instruction of the Deaf and Dumb was held on Monday, June 30th, 1884, the chair being occupied by B. St. John Ackers, Esq. In opening the proceedings the Chairman said this Conference on the education of the deaf had been called by the Society for the Oral Instruction of the Deaf and Dumb, Fitzroy Square, which Association was the outcome of the efforts of the late Baroness Mayer de Rothschild, together with other influential and philanthropic persons, to establish an institution in which all deaf and dumb children should be instructed on the pure oral system. That Association had called this Conference, with the view of considering this special branch of the education of the deaf, which in this country was not yet, as it was in all other civilised countries save one, the chief system in use. Such was not the case until the great Congress in Milan in 1880, but he was happy to say that since that date this pure oral system had spread to such an extent that now a considerable majority of all the schools of the civilised world were conducted on this system, and it was to promote that system and make its merits known that he should call on Mr. Van Praagh, the director of the Fitzroy Square Association, to read his paper, after which Mr. Dalby, the celebrated aural surgeon, would

read a paper. He was sorry to find that notice had not been received by all the institutions even in this country for the education of the deaf and dumb, requesting them to exhibit in the educational department of the Exhibition, but this could only have arisen from some mistake, for as one of the members of the Education Committee, he had himself handed in the names and addresses of 500 schools for the education of the deaf, omitting none that he knew or could hear of. Before calling upon Mr. Van Praagh, he would only mention one fact which he was sure that gentleman and all others would be sorry to learn, that was that Professor Leon Vaisse, the leader and pioneer of this system in France, had just been removed by death. He had suffered in this great cause as few had, for on account of his steadfastness to this principle he had to give up the magnificent appointment of head of the National Institution in Paris, but he told him shortly afterwards, that so far from daunting him, it would give him more time to further what he had so deeply at heart, namely, the giving of speech to all the deaf in France. He had, indeed, nobly fulfilled that mission, and not only France, but the whole world were deeply indebted to him for his efforts.

ORAL INSTRUCTION OF THE DEAF AND DUMB.

By William Van Praagh,

Director of the School and Training College for Teachers of the Association for the Oral Instruction of the Deaf and Dumb; Officier d'Académie de France.

Introduction.—The subject I have the honour to introduce to your notice, viz., that of the Oral Instruction of the Deaf and Dumb, is one which must commend itself to your heartiest sympathy. It is not new. Since 1867, and more particularly since 1871, it has been brought prominently before the public, both by the Association I have the

honour to represent, and later by others which have followed in its steps.

Deaf and Dumb.—Not only in our own, but in every European language, the expression, "deaf and dumb," is the general designation for a person who, through want of hearing, has been unable to imitate spoken language. It ought, however, as I shall soon show you, to be limited to deaf. But, as in many instances the effect of such limitation would be misleading to the public, it is wisest, I think, to use the expression as it stands.

Causes of Dumbness.—Dumbness is traceable to two causes, viz., deafness and idiocy. However malformed may be the organs of speech—even though they should be such as to render the production of distinguishable sounds impossible—yet, so long as any one is able to produce sounds at all, he cannot properly be called dumb.

Classification of Deafness.—Deafness is either congenital or acquired; and its subjects in each case are divisible into the totally deaf and the partially deaf; the latter being subdivided into five classes—that is, into (*a*) those who perceive the human voice when it is used close to the ear, without being able, however, to distinguish the separate sounds; (*b*) those who can distinguish the vowels when they are loudly pronounced in the ear; (*c*) those who understand (but with difficulty) some words known to them when these are clearly pronounced in their ear; (*d*) those who, without effort, understand all that is clearly pronounced in their ear; and, finally (*e*), those who can hear a raised voice. Immediately it is clearly ascertained that a child of sufficient age comes under any one of these divisions it ought to be sent to a school for the deaf; for it is really astonishing how quickly, under such circumstances, it will forget to speak, and how immense are the disadvantages caused by but a few months' delay.

Instruction of the Deaf.—In proceeding to give you my own opinion as to the best method of teaching a so-called deaf and dumb child, I must state that there are at present three systems for teaching the deaf and dumb: 1st, the

German or pure oral system, which teaches by articulation and lip-reading only; 2nd, the French or sign-system, which employs artificial signs and the manual alphabet; and 3rd, the combined system, which tries to unite both of these, but which makes use of signs for conveying instruction, and teaches articulation as an accomplishment. I will now remind you of what I said when I began, viz., that dumbness, as such, does not exist. The undoubted fact is that we have to deal with one defect, and one only, and that is with the want of hearing. Find a substitute for the faculty of hearing, and in a great measure our difficulty is overcome. Every sound we articulate produces vibration of the face and throat, as well as of the lips. The deaf can be made to *see* what is said by carefully watching these movements, and the *sight* thus becomes that substitute for hearing which we call lip-reading. The teaching of lip-reading requires the utmost care and attention, since the clear understanding what is said is of as great, if not indeed of greater value, than speech.

Now, as regards instruction in speaking: It must be particularly observed that sound can be *felt*, as well as *heard* and *seen*; and here, ladies and gentlemen, is a clue to the method we adopt. The deaf child is, like his hearing fellow-creature, taught speech by imitation. His teacher follows the same natural method of teaching which, in the case of a hearing child, is instinctively practised by the mother. The teacher begins by making his new pupil breathe properly, and notice the difference between inspiring and respiring. He then proceeds to teach vowel sounds and consonants, and to combine the vowel sounds with the consonants so as to form words. The meanings of the words are illustrated by pointing to the objects themselves or to pictures of them. The teacher then passes on to give his first lessons in language. The words are formed into simple sentences, the simple sentences into compound ones, and so by degrees more advanced lessons are reached, and ultimately, by means of speech and lip-reading, the pupil is able to receive instruction in all the branches of a sound

education. It may be remarked, that to teach a deaf child properly requires the utmost energy and devotion. The teacher must also articulate well himself, and be prompt to correct the slightest defect in the pupil's imitation of a sound, or else good results cannot be gained. Speech, must be used as exclusively to a deaf child as to one that can hear, so as to force him to practise lip-reading. As soon as he can express any want by speech, the natural sign, which had been previously indispensable, must be rigorously discarded; for any attempt to combine this system with one which admits of signs would produce unsatisfactory results.

The acquisition of lip-reading requires the child's entire attention. "It would be hard," as a friend of mine once said, "to make a deaf child watch the face and the button-holes in the speaker's waistcoat at the same time." Besides, lip-reading must be his only vehicle for language; if he be allowed to convey what he wishes by signs, and if signs are used to convey knowledge to him, he has an additional vehicle for language, and he will not easily attain perfection in seeing power.

The pure Oral System—to whom applicable.—My firm conviction is, that the best way of teaching a deaf child is to follow the pure oral system: 1st, because it emancipates the deaf-mute by giving him the great gift of speech; 2ndly, because it develops the power of understanding what others say; 3rdly, because it teaches language in the natural way; 4thly, because it extends his means of acquiring knowledge, since every one whom he sees talking, and who converses with him, becomes to him a teacher, whilst at the same time it destroys his isolation, and makes him better fitted to mix in society. The system is applicable to all classes of deaf children except to those of defective vision and weak intellect.

Course of Instruction.—The course of instruction extends over eight years, the two first of which are spent in what may be called the "infant school" for the deaf child. The instruction in speaking, lip-reading, reading and writing, go

together, hand in hand, throughout the whole course, which includes instruction in spoken and written language, and comprises all the subjects of an ordinary education.

Day Schools versus Boarding Schools.—A great question in the education of the deaf child is whether the preference should be given to boarding or day-schools. Much may be said on this question, but I shall have to deal with it briefly, or else this paper would assume the size of a book, and the patience of my audience be sorely tried. One of the commonest fallacies of the parents of deaf children, and particularly of those who belong to the poorer classes, is, that they ought to be relieved from the expense of procuring board for their deaf children, and send them to asylums where everything will be gratuitously provided for them. Now this is plainly a pauperising system as regards the parents, and a demoralising one as regards the children. Removed from poor homes, and placed in asylums where everything is provided on what is to them a comparatively luxurious scale, when they leave the institutions and have to face the outer world, they often turn out dissatisfied men and women. The continued association of a large number of deaf children is also to be deprecated from a moral point of view, whilst progress in speaking is rendered difficult, since it is impossible to keep a sufficiently strict watch upon them to prevent their making free use of signs. Now, on the other hand, where instruction is given in day-schools, family life may be preserved. The children live with their parents, who have to provide board for them precisely in the same way as for their hearing children. If the homes are too far to allow the children to go daily to and from the schools, they can be boarded with families of social positions similar to their own, where they will witness the round of daily life, have a much more extensive field for observation, share the joys and sorrows of a home, and, after school, mix with their hearing fellow-creatures. Taking these and other circumstances into consideration, I decidedly give the preference to day-schools, both from a moral and a social point of view.

Expense of Education for whole Course. Another point of practical importance is the expense. Parents often form exaggerated opinions of the cost of educating a deaf child. If the child live near a day-school, the cost will be exactly the same as that of a hearing child; but if at a little distance off, yet within easy reach of the school by any public conveyance, there will be the travelling expenses in addition, whilst, if the child's home is in the country, suitable board and residence must be provided, which can be obtained in London at 9*s.* per week and upwards, according to the class of family desired. Clergymen and medical men are best fitted to recommend residence where children will meet with true parental care.

Is the System applicable to all Classes of Children?—During my professional career I have often been told by friends interested in this subject, that the system is eminently suited for the children of the rich, but that they have failed to see its practicability for the children of the poor, as for example, for those attending Board School classes. Now this is a matter which deserves the most serious consideration, since a system which claims to be superior to others ought to be made suitable for all classes. What are the objections? It is urged that it is impossible for poor children to take a course of instruction extending over seven or eight years, and that the parents of such children do not, as a rule, speak with sufficient accuracy either to be understood by their children or to correct their mistakes. As regards the first objection, viz., that which is based on the plea of poverty: it is true that in the schools which follow the French system, a course of five years is allowed, though all the teachers in those schools agree with those who practise the German system in saying that it is much too short. Now, if the circumstances of the parents are such as positively to preclude a longer course than five years, I believe it will be found that of two children of equal capacity who may be trained during that period, one under the French, and the other under our own (that is the German) system, the latter will be much more advanced

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than the former. If, however, it should be said that the children of the rich will succeed better because their parents are able to allow a longer time for instruction, then since the same remark applies to children taught on the French system, the German so far does not suffer by comparison. As regards the second objection, I must admit that I have known deaf children imitate exactly the phraseology of those with whom they constantly associate, thus reproducing their errors, but who will deny that this is almost always the case with hearing children of the same class?

The children of educated parents taught on the pure oral system have this decided advantage, that their errors of speech and language can be more easily corrected at home.

Apprenticeship.—Let us now consider the position as regards the prospect of employment of children educated on the pure oral system as compared with that of others who are educated under other systems? My own experience again enables me to give you proofs, and, if necessary, to introduce to you living proofs of what I am about to say. Deaf boys and girls, once able to express themselves in spoken and written language, and to follow what is said by others, can be apprenticed in the same way as hearing boys and girls. Their employers can explain to them, and that too by word of mouth, the secrets of their handicraft. Their fellow-workmen can enter into conversation with them; and in their turn the apprentices can become masters, able to employ hearing workmen. In fact, to all intents and purposes, the deaf apprentice, taught on the pure oral system, is almost on a par with his hearing fellow-workman. The kind of occupation for which a deaf lad is fitted, will, to a large extent, depend upon the class of family to which he belongs; but care should be taken not to apprentice him to anything that is subject to the changes of fashion, but to some industry of a permanent character.

Training of Teachers.—In order to ensure the success of the instruction, it is of the greatest importance that the

work in the school should be efficiently done. At the International Conference in Brussels, held in 1883, I said, "It is not the system that makes the teachers, but the teachers who make the system." The success of the work being mainly dependent upon the qualifications of the teachers, it is self-evident that provision must be made for their proper training. In my opinion, those who have already received their training at some ordinary college for the teachers of hearing children are most fitted to be trained as instructors of the deaf and dumb, since they are conversant with the discipline of school-work, and they have simply to receive the special training necessary for the kind of instruction which I have already explained to you. I attach the utmost importance to the *practical* training of the teacher. Many teachers, who have received merely theoretical training, know how to do the work, but fail in their results. The difference is well expressed by the two German verbs "wissen" and "konnen." In my opinion, it is only in a well-conducted school, and under a successful practitioner of the system, that the special training can be given. This training usually occupies about twelve months.

History.—No paper on the Oral instruction of the deaf and dumb would be considered complete without a reference to the history of the introduction of the system into this country. The subject is painful to me, because on these occasions I miss so many friends who during their lives worked heart and soul in the good cause.

I cannot do better than read the following extract from the report of the Association for 1883:—"The active labours of the Association commenced July, 1871. Previously to that time, as detailed in the history of the Association, which will be found on page 14 of the said Report, the adoption of the system at the Jews' Deaf and Dumb Home, in 1867, had been the means of bringing Mr. Van Praagh to England, and since 1868 there had appeared notices in various journals of its success in that institution, and some pamphlets had been written on the subject. In

1871, this Association caused papers upon the system to be read at the Social Science Congress, at Leeds, by Mr. Dalby, and at the Society of Arts by Sir George (then Dr.) Dasent. In the following year the School in Fitzroy Square was opened. At that time, and at these meetings, the opinions of most of those interested in the teaching of the Deaf and Dumb were freely expressed. It was generally asserted *that the Oral system was not available to the majority of deaf mutes, and could only be successful in cases where superior mental capabilities enabled the pupil to acquire speech and lip-reading*, and these repeated assurances that the opponents gave, based on the experience of their own experiments, were generally received as a convincing proof of the correctness of this view.

"Feeling that it would be impossible to contend against this prejudice unless a practical refutation of the theory could be given, this Association resolved to open a school, and *to admit all applicants who might present themselves, rejecting only such as would be rejected by any other deaf and dumb school*, i.e., *idiots, and those who really possessed sufficient hearing power to be educated in the usual manner.*

"The result of this experiment was highly satisfactory, and in the course of a short time it was shown without doubt, that the argument that the Oral system was only suitable for the instruction of deaf mutes of extraordinary intelligence was quite fallacious.

"During the following year, letters and articles for and against the system were constantly appearing in newspapers and magazines whereby the notice of the public was frequently drawn to the subject, which was fairly argued on both sides.

"In 1874, the pupils of the school were publicly examined at Fitzroy Square, *and the theory that instruction by the Oral system could only be used in special cases was thereby at once demolished.*

"In 1875, there was a meeting at the Mansion House for the purpose of forming an endowment fund, and subsequently a public examination was held at Grosvenor House,

where the Princess of Wales and some of her children were present.

"In 1876, the Duke of Westminster again lent his house for the public examination, and the success of the system in advanced education was more fully exemplified by the senior pupils.

"In 1877, it was resolved to hold a dinner in aid of the Association, and the Prince of Wales graciously consented to take the chair. Some pupils were taken to Marlborough House for the Prince to examine personally, and the result of this effort was so successful that no festival has been since held for the purpose of collecting funds. It is impossible to allude to this period without making mention of the sad death of the late Baroness Mayer de Rothschild, who had been the originator of the Association, and to whose energy and unfailing liberality its success is mainly due.

"It is about this time that the Oral system for teaching deaf mutes may be considered to have taken firm root in the public mind, and its further development can be merely looked upon as the natural result of the practical illustration of its advantages over every other mode hitherto practised in this country; since then, meetings and conferences have been held on the subject, not only in many parts of this country, but in several places on the Continent. A resident Training School for Teachers has been established at Ealing, and the managers of that society have actively aided the cause by being numerously represented at these meetings and energetically agitating in favour of the general adoption of the system."

Other schools in England are now also pursuing this system, and we certainly are on the road to witness its general adoption. The International Conferences at Paris, and particularly that held at Milan, and the last at Brussels, have upon the Continent fully established the superiority of the pure Oral system.

Government Aid.—While doing justice to the value of private assistance, it is to be hoped that the Government

will soon lend pecuniary aid to the education of the deaf, so that the hands of managers of institutions may no longer be fettered by "want of means." In looking forward to the happy times when Government aid, supplemented by private support, will enable us to provide the very best instruction for the deaf, I am reluctantly obliged to take leave of the subject I so dearly love; and, as I do so, I wish every one of my fellow-workers, and all who are in any way willing to contribute towards the amelioration of the condition of this afflicted class in this or other countries "God speed" with all my heart. Deaf mutes have peculiar claims upon our sympathy; they are with and among, and yet not of us; untaught, they are a race apart; and to bridge over the gulf which separates them from their fellow-men, to reduce their awful disadvantages to a minimum, and, so far as possible, to administer instruction to them through that *one entrance* from which it were else *shut out*, and place them fairly on a level with ourselves, is surely one of the noblest works which man can perform.

EDUCATION OF INCURABLY DEAF CHILDREN.

By W. B. Dalby, F.R.C.S.

It fortunately does not fall to the lot of many to observe the process by which a young child who, having in consequence of disease become incurably deaf loses the power of speech; but it is most important that every one should be familiar with the fact, because to a knowledge of the danger will frequently be added a means of its prevention. There are, it is well known, a number of diseases which induce complete or partial and irremediable loss of hearing, and if this incident or accident in the course of disease occurs to a child before the age of seven or eight, in the

ordinary course of events the child becomes dumb. To appreciate the physiological process (for the loss as well as the acquirement of speech is a physiological process) it is only necessary to compare the case of a child, say six years old, of ordinary intelligence who has in the course of a few days lost all hearing power, with another case in which a child of the same age and speaking the same language is removed to a distant country, where it never hears a word of its first language; at the time when the first child has lost all articulate language (a period to be counted by months) the second child will be found quite unable to understand a word of its first language, or to indicate any object by a word in that language. The fact of it having acquired a second language in no way affects this. The explanation of the loss is the same in either case, viz. in whatever degree young children reflect, their thoughts are seldom formed to themselves into words (this does not come till much later in life, when it may be noticed that an adult, who speaks two languages with equal facility, will detect himself thinking in either); children readily learn but as readily forget; they depend for their thought so exclusively upon their immediate surroundings that the relation of objects and acts to the words which denote them soon becomes dimmed and lost to them if they do not hear these words repeated.

Thus it will be seen that when a child has become suddenly deaf, he does not at once lose the faculty of denoting objects by words, but the words are gradually clipped and spoken with increased indistinctness as time goes on, until they become absolutely lost. Let me here say that a very moderate extent of irremediable deafness is quite enough to induce complete loss of speech in young children, but that any degree of hearing which is left ought, I think, to alter the course and method of instruction which should be pursued.

The following examples of the condition under which children may be left as regards their hearing, and the plan of education which I suggest will illustrate what I wish to

say. (1) A child who has entirely lost hearing and can read, should be made to read several times during the day, and be taught lip reading. The constant repetition of the words which it has already used will cause them to be retained by reading, and an increased vocabulary will be acquired by the lip reading. (2) A child who has become totally deaf and cannot read, should at once be taught on the pure oral system, and words which it could pronounce, will, by constant repetition, be retained. (3) If a child can understand words pronounced in its ear; still better if it can hear a raised voice, it can be taught to articulate new words by making use of the hearing; its articulation, whilst becoming deficient, can be corrected, and efforts in this direction, added to lip reading, will enable it to retain speech. It cannot be too urgently insisted on that the educational treatment of this character must be commenced immediately after the occurrence of the deafness. When this is not done, that is, when the originally acquired vocabulary has been lost, the education will have to be the same as that of a congenital mute, except for the important part of taking advantage of the partial hearing to correct the articulation; and thus, speech will have to be acquired again. By processes carried out on these lines, but varied according to the circumstances of the case (of which skilled teachers will be the best judges), and especially regulated according to the amount of hearing left; numbers of children have within my own knowledge during the last twelve years been saved from mutism. It will, I am sure, be freely admitted by those competent to form an opinion that up to a comparatively recent date, all children who suffered as I have described became dumb. It was the rule, to which I am unaware of an exception. If it is asked why was this, I reply that before the introduction into this country of the pure oral method of education no one could have been in a position to make the remarks which I have ventured upon to-day. The mode of proceeding with these children could not have suggested itself to any one. It has become possible by means of a side path, so to speak,

which could not have been opened unless the main road of the pure oral method had come into use. It is hardly necessary to say that a most complete revolution has taken place since the year 1871 in the mode of education of deaf children. When in that year, on behalf of the Association for the Oral Instruction of the Deaf and Dumb, I had the privilege of directing public attention to the matter in a paper read at the Social Science Congress at Leeds, "On the Education of the Deaf and Dumb by means of Lip-reading and articulation," with the exception of two or three small schools, the pure oral method was not taught in this country. The progress of the change which has taken place has been so familiar to me, I have taken so active a part in it, and have written so constantly in the Press upon the subject, that I hope I may be allowed to say a few words upon it. In the first place, I would ask permission to pay a passing tribute to the honesty of purpose and the indefatigable industry of the Teachers of the deaf and dumb. It was but natural that they should at first regard, with some degree of jealousy, the introduction of a system which so completely put aside one in which great facility in teaching had been acquired, and which in its way was very successful; but the whole subject was fairly and carefully examined, and the oral method has not only been gradually adopted, but enthusiastically propagated by large numbers, amongst whom may be reckoned many of those who were at first opposed to it. The Association for the Oral Instruction of the Deaf and Dumb, which inaugurated the revolution to which I have alluded, was in a few years followed by The Society for Training Teachers for the Deaf and Dumb at Ealing, a society which has been doing its work with great energy, and adding immensely to the general diffusion of the system. Then must be reckoned the influence of the members of the medical profession throughout the United Kingdom; for they have, through the medical press, been made acquainted with the existence of the oral method; and, as it may be taken for granted that the doctor is the

first person who verifies the fact of the child being deaf, it has become his duty to inform the parents of every congenitally deaf child that the oral method is within their reach. And here let me say that, after all, parents are those who should select the plan of education for their child, and the merits of the system must be judged by its results as observed by the parents. In 1880, I wrote as follows: "What is the opinion of the better educated classes upon this method may be learned from the following circumstance. In my position as aural surgeon to one of the principal metropolitan hospitals, a very large number of deaf children of all classes come under my observation. It has been my habit, on all occasions, not to advise as to either method of education, but to afford opportunities for thoroughly observing both. I can confidently assert that on every occasion during the past seven years the parents have selected the articulate method; and whenever this plan has not been followed out, it has been in the cases of hospital patients, whose means were not sufficient to meet the expense, and who were therefore obliged to place the children in asylums, or completely neglect their education. From such experiences as these, whilst having no doubt as to the advantages of the articulate system, it has become a question with me whether, for the labouring classes of the poorer sort, this system is applicable, not simply because of the expenses that are incurred during the education, but also on account of the number of years during which it is necessary to keep the child at school." I may also add that the pure oral method is obviously unfitted for children with cleft palate, or those in whom sight is in any way deficient; and in one class of cases where the loss of hearing is the result of disease, the vision is very frequently at the same time affected.

DISCUSSION.

Rev. Mr. PEARSON said it was with great pleasure that he rose to say a few words on this very interesting question, and it was very gratifying to think that amid the innumerable claims on philanthropy the interest felt for the deaf and dumb should be as great as it was. He could only wish for one thing further, that the interest felt in the condition of the blind should be equally great. With regard to this oral system, which was now almost universally adopted, he might say a word or two from his own experience. It was called the German system, but it ought to be called the English system, because if they were to believe a very old authority, that of the Venerable Bede, in Beverley, a town in Yorkshire, there was a certain abbot, St. John of Beverley, who was always considered a very saintly man, and who showed that his saintliness did not exclude love and charity, inasmuch as he himself taught, on some kind of oral system, a poor heathen whom he converted. We had a right, therefore, in a certain sense, from an historical point of view, to call this the English system; and he hoped, with regard to the practice, it would become more and more English. The question had been raised whether the poor could be taught on the oral system, and he stood forward, as the Chairman of the Committee of the Deaf and Dumb on the School Board for London, to give his experience. They were all interested in the East-end of London, and knew what sorrow and misery were rife there—what poverty, and destitution, and ignorance. Some people did not like Board Schools, but he often pointed to the Board School in Bethnal Green and other parts of the great East-end, and said what would those places be without a Board School; and in the very midst of one of the worst districts, known in School Board parlance as "a difficult neighbourhood," was planted a

school for the teaching of the deaf and dumb on the oral system, and the teachers from that school came from the Oral Association, at Fitzroy Square, about which Mr. Van Praagh knew so much; and from the Ealing College for the Training of Teachers for the Deaf on this system. By the assistance of those two admirable colleges, the poorest neighbourhoods of London were being taught, and a similar school was being built also in Southwark, and he hoped there would be other schools of a similar kind in connection with other Board Schools. Whenever he had an opportunity of seeing Mr. Mundella, he always bothered and worried him as much as he could about Government aid for the deaf and dumb. There were some who said that the great force of female influence lay in reiteration. He had never found it so, because he was always ready to yield to the ladies without reiteration; but he meant to adopt that system, which ladies were said to pursue, on Mr. Mundella, and never to leave him until Government aid was granted to the deaf and dumb. So much had been done, that he was quite certain they might look forward to the future with very sanguine expectations. He hoped the time would come when they would meet in that place where the ears of the deaf would be unstopped and the lips of the dumb would be loosened; and it ought to be the object of all to make this earth as far as possible like Heaven, and they could not do that better than by promoting the cause of the deaf and dumb, and especially by furthering this system of oral teaching, which was carried on by the societies he mentioned.

Captain DE CARTERET BISSON said the subject they had met to discuss was a very highly important one. The two papers which had been read pronounced the oral system of the education of the deaf, who had hitherto been known as deaf mutes, as being the best; and he was not prepared to object to that; but, on the other hand, he did not consider that in a great number of cases that system was absolutely the best system which could be adopted. They all knew

that in the year 1760 a noble and esteemed member of Parisian society, the Abbé l'Epée, introduced for the first time a thoroughly organised system of education for that afflicted class, which was followed shortly afterwards by the oral system, introduced for the first time by Professor Heinicke in Germany. He did not know the exact date of the saintly scholar who devoted his time to teaching a deaf mute in this country; but as far as his researches had gone, it seemed to him that it was only in the last sixty years that any system of education for the deaf and dumb had been recognised in England. At the conference held in Milan, resolutions were passed unanimously in favour of the oral system, which were confirmed at the recent International Congress held last year in Brussels, thereby accepting in all its details that system as the purest; but still he thought there were many cases where the combined system should be employed. He alluded especially to those whose organs of speech were not perfect, to whom he thought the combined system would naturally be a necessary adjunct to education. In addition to that, he would observe that the technical education, which was now taking so strong a hold in this country, should form a very strong and special feature in the education of the deaf and dumb, and in connection with our larger institutions workshops should be instituted, where various handicrafts, useful for their future career, might be taught. He had been much pleased to hear the Rev. Mr. Pearson allude to the firm manner in which he had attacked the Vice-President of the Council of Education on all occasions on behalf of this afflicted class, and was very pleased indeed to state that a very influential member of the House of Commons had it in contemplation to bring the matter forward next session; and he hoped his endeavours would be heartily seconded by other philanthropic members of that House. There was one point of disadvantage with regard to the oral teaching of the deaf and dumb which would apply very closely to those who followed the prevailing custom, as he saw the Chairman

did, and wore beards and moustaches. The deaf and dumb, unless taught the combined system, would, he thought, be debarred from any intercourse with that large section of the community, inasmuch as, the lips being hidden, they would not be able to follow their remarks, however clear they might wish to make them. He was sure they would all wish hearty success to the oral system, and not only that, but every system of education for the advancement of the deaf and dumb, that they might brighten their hard lot, and bring them nearer into communion with the rest of the world, and make them feel less and less the inestimable loss of speech and sound.

Mr. LENNOX BROWNE said it was somewhat unfortunate that this Conference on the Education of the Deaf and Dumb had not been arranged to take place as an International one under the auspices of the Educational Committee, instead of under the auspices of the Health Committee, of the Exhibition. It was very difficult, indeed, to divorce the subject from either one or the other, and it was well to view it in both aspects. Up to the present, it had been discussed rather from the educational point of view, but he would beg to say a few words from the medical aspect. It appeared to him that the generally accepted classification of so-called deaf mutes was one rather of symptoms than of causes. Mr. Van Praagh had pointed out in his paper that the words deaf and dumb were really a misnomer—people were only mute because they did not hear. The classification given in both the able papers they had heard, of the causes of those who could not hear, was too arbitrary, and it seemed to be forgotten that each division represented a condition of disease more or less distinct. Probably very few children were born absolutely deaf, though many of them became deaf in early age before the gift of speech was required. The experience of various physicians, notably of M. Bonnafont, had shown that it was quite possible to remedy the deafness of children, not only when it was dependent on obvious causes, but when it was of the same nature as that recognised as the most ordinary cause of chronic

deafness in the adult. However that might be, he had frequently the opportunity of treating patients at hospital sent to him as deaf-mutes, and especially by Mr. Stainer, whose name was well known as one of the most benevolent and most active workers on behalf of this class of the afflicted, and who was now gone to America for the purpose of attending a conference on this very subject. If Mr. Stainer were present he would support him in the statement, that not a few cases that came under notice in connection with Board Schools had been under medical treatment so greatly relieved as to be by no means incapable of education in the ordinary way. The speaker quite recognised how this state of things had come about : when the system was introduced the opponents of it at once began to say that all sorts of experiments were about to be made on the deaf, and for fear of being laid open to this reproach teachers of this system have been rather backward in endeavouring to remedy deafness. But now that it was so firmly established he thought there ought to be some attempt made in this direction. He knew that at all of those schools there was an aurist ; but whatever might be said to the contrary, the appointment was but two often performed in a perfunctory manner ; and if no attempt were made to improve the hearing of the children who came under education, he did not see the use of those aurists. You might as well have a special oculist, or skin doctor, or officials of any other kind. Where there was an aurist every child should be examined by him, and a record made on admission of an accurate diagnosis of the condition of its organ of hearing, and treatment should be adopted in those cases where there was the slightest chance of success. This treatment could in the majority of cases be perfectly well carried out by the nurses and attendants, and would not require anxious medical attendance. Probably all had some experience of deaf children, and there was a form of deafness which by a little blow of a bag was at once relieved. In the majority of instances that improvement was lost if not pursued, but with perseverance it was pro-

gressive and permanent. This led him to say that nothing was more gratifying in result than treatment of such cases in private practice, whilst nothing was more hopeless than similar attempts at cure in hospital practice without patients, because there existed such an amount of apathy amongst the poor with regard to this condition, that home cases were as a rule neglected. As Mr. Van Praagh had very well said, the only matter to attend to was the want of hearing. Mr. Dalby had alluded to the fact that the deafness might be complicated by other diseases, as loss of sight or by cleft palate, the latter impairing articulative power; but it must also be remembered that most of these complications were removable by medical or surgical treatment; and there was no reason why such measures should not be carried out. As to defect of sight being used as an argument against oral teaching, it could be urged with at least equal force against teaching by signs. He had no hesitation in giving in his adhesion to the oral system as superior to all others, and as, in fact, the *only one* which should be adopted or recommended; nor would he, as an aural surgeon give parents any option, but he would urge its superiority over all sign systems with all possible force. He would, however, remark in this connection that he thought the name unfortunate, because people who were not Latin scholars did not quite understand the difference between *oral* and *aural*. Many used the word aural instead of oral. They heard of an aural surgeon and aural disease, and unless they saw the two words written they did not know the difference, and did not understand that this was a system which depended on the mouth and not on the ear. He thought if the two systems were named the labial system and the manual system or the lip and sign systems respectively, a great deal of confusion which had arisen, and might continue to arise, would be obviated. With reference to boarding establishments for these children, it was most important that the keepers of such establishments should understand the system, and should have some measure of education in correct pronunciation; for amongst

the various advantages which Mr. Van Praagh had mentioned of the oral system he had omitted one, namely, that it had taught those not deaf to speak with distinctness. The almost universal complaint of deaf persons was that people either mumbled to them or else shouted at them. Now it was not at all necessary to shout at a deaf person; almost every deaf person unconsciously learned to read with his eyes, and those who had not some experience of the subject would be astonished to find how few speak really with distinctness. Failure to hear in ordinary deafness was not experienced with the vowels but with the consonants, and these depended for distinctness solely on the correctness of enunciation. One word with regard to the moustache. Mr. Van Praagh wore a moustache, and so did most teachers present in this conference, and it was not the slightest impediment to pronunciation. The one thing required was for a person to speak only with his lips, and to let the pupil see his lips in making the sounds, not to endeavour by sign of head or hand to emphasise something which required no emphasis beyond the distinctness of utterance.

Mr. KINSEY, Principal of the Ealing School, said he was delighted to find the Conference was supported by two eminent medical gentlemen, one of whom had read the paper, and the other had offered some valuable remarks. Alluding to Mr. Lennox Browne's observations with regard to the importance of medical men and aural surgeons having something more than a nominal appointment with regard to institutions for the deaf, he seemed to think that there were a great many cases in present institutions of children who were not so deaf as they were supposed to be. If that were so, and he believed it was the fact as far as medical institutions were concerned, all he could say was that it was the fault of those in charge of the children's education. The practice at the college with which he was connected was to make a periodical examination of those pronounced to be deaf by the aurist, to see whether there was the slightest improvement in hearing. At present he could not

say they had ascertained that to be the case; but if they did, the first thing would be to have the case referred back to the aurist, for him to make a more extended examination. He quite agreed with Mr. Browne with regard to the connection between the mouth and the ear, and doubtless many people had misunderstood the system from this cause. In America they found that one of the first Professors there, who had been for many years a strong advocate of the sign system, and opponent of the German system, was now writing and advocating the aural system of teaching; but he did not mean what they meant, the speech system; he meant teaching through the organ of hearing of supposed deaf persons, who had been incarcerated in silent system schools for some years, and were now discovered to be in fair possession of hearing—so much so, in fact, that they ought never to have gone to schools for the deaf at all. Mr. Dalby had mentioned the fact that a young child losing its hearing without proper teaching would soon become deaf, and compared it with a case of a hearing child taken away to a foreign country, and there losing its native language from not continuing to hear it. It was sad to think that children with perfect command of language, and becoming deaf, had in the course of a few years become dumb; and a colleague of Mr. Dalby's, at one of the recent conferences, mentioned a quite deplorable case of a child twelve years old, losing its hearing, being sent to a sign system school, and there, in the course of two or three years, becoming dumb. They hoped that when the medical profession fully realised the fact that dumbness was no part of deafness, but only a question of ignorance of the method of preventing it, they would no longer have to lament such terrible cases as that. The Rev. Mr. Pearson had referred to the name given to this system, and questioned whether it was right to call it the German system. This was a very old standing objection, and all he could say in answer to it was that the case he referred to was an isolated case—there had been no other cases in later days—and that to Germany was

distinctly due the credit for having nationalised this system and adopted it universally. It had been in operation there over a hundred years; and Captain de Carteret Bisson had mentioned the name of another celebrated teacher who nationalised the French system, and hence it had been called the French. He could only wish, from the energetic way in which Captain de Bisson had spoken, that he knew something more of this system, because he felt quite sure that if he went into the matter very carefully he would have thrown the full weight of his authority in favour of the German system. He said he believed the combined system was the best, because there were cases where the articulative organs were defective, and so many people wore moustaches, that the oral system would not be applicable. But if that were so, how would the combined system teachers be able to teach speech under those conditions? This was an old-standing quarrel between the different teachers. They said the deaf ought not to be dumb—that they should be assimilated to those who could hear in every possible manner; that the deaf should not be marked because they were deaf, and branded and rendered dumb, but should be treated in every possible way as hearing children. If teachers abroad could invariably teach not merely the intelligent deaf, but the imbecile deaf, the afflicted, the weak deaf—if they could do so universally and with success—he thought it was quite time that people in England should accept the position of the teachers of the German system, who said that English teachers who knew the system thoroughly, and who had been trained in it, could do as much for the English deaf as foreign teachers could do.

The Rev. THOMAS ARNOLD said he had been a practical teacher, and the points to which he should refer were practical. For twenty-five years he had been engaged in the oral education of the deaf and dumb, and he had also prior experience in the sign method of teaching, and therefore he might be permitted to make a comparison of the two systems. His conclusion was that, first of all, for

educational purposes the culture of the understanding, the improvement of the memory, the enlightenment of the conscience—in fact, in every department of education, the oral method was far superior to the sign method; and he said this because he had been able to achieve more by the oral method than he could by the sign method. Of course, in all such matters as this the capacity of the teacher must be taken into account. The education of the deaf and dumb would be in proportion to the education and ability of the teacher. This kind of teaching demanded special mental and moral endowments, for not every one was fitted to be a teacher of the deaf and dumb. They must be those who were constitutionally fitted for the work, and who at the same time had intense benevolence, which would awaken the longing and desire to be instrumental in the education of these children, and who would never spare toil or self-denial in any department that they might accomplish their work. Nearly everything therefore would depend on the capacity and devotion of the teacher. But he was happy to say that England was not failing in this respect any more than in any other department of benevolence. Whenever there was a great work to be done, something that would benefit others, that would call forth effort and devotion, English ladies and gentlemen would be found prepared to enter upon it, and do their work with the intensest devotion and application. The first part of the education was the most difficult of all. Teaching to speak was a quality which few teachers pre-eminently possessed, and he would appoint the very best teachers of an institution to teach the articulation classes. In the matter of the training of these teachers, twelve months or two years would not suffice for the purpose. It was not enough to have theoretical knowledge; there ought also to be practical knowledge. Quite recently he had an application for a teacher to go to a school to be established at Leicester, and there was a young man in his eye who had been for some time in an institution engaged in oral instruction. But he had only advanced through two or three of the

classes, and therefore he was not prepared to take charge of a school where all grades would require instruction. His advice to him therefore was to remain where he was and master the system, although it might require four years instead of two; and unless there were institutions which were prepared to give two, three, or four years to this training, it would not be the success in this country which had been achieved in Germany, France, and Italy.

The medical profession, which was ever forward in everything benevolent, whose sympathies were co-extensive with all human woe, numbered amongst its members some of the most distinguished teachers of the deaf and dumb. The man who might be regarded as the founder of the German method was a medical gentleman, who retired from his profession that he might become a teacher of the deaf and dumb in the Netherlands. The medical profession as a whole might render great and practical help in this matter, because teachers of the deaf and dumb required a thorough knowledge of the organs of speech. No descriptions and no plates, no matter how accurate they might be, could give to the eye and understanding of the teacher a clear knowledge of those organs of speech. He ought to be in the dissecting room, to be conducted by a skilled operator, so as to learn under his hands not only all those organs, but at the same time all their movements in the production of the various sounds. Why could not such a chair be created in this country? Could not an endowment be furnished out of our national funds which would enable teachers to go at a very small expense and listen to these lectures for a limited time, and so go away with a thorough practical knowledge of the organs of speech. Italy was doing something in this department, and Germany had done more, and France was beginning to do something, and England as a practical nation ought not to be behind in this matter. In relation to this education of the deaf and dumb, he feared that as a nation we were still behind in our sympathies and in our thorough understanding of the nature of this privation and the loss that it entailed.

People ought to live by the deaf and dumb, to see them in their daily life, to enter into all their relations, and then they would find out, as Milton said with regard to the loss of his sight, that not merely half the world was shut out, but nearly all the world that provoked thought and joy, and knowledge and rich evidence of the power, and wisdom, and greatness of the Creator of all things. The deaf and dumb uneducated was almost a mere animal under the government of his own passions, and therefore it was more than sending missionaries to the heathen, who had partly knowledge of these matters; but the deaf and dumb had no knowledge of them, and therefore the philanthropic should urge every one to understand their case and lose not a single day in trying to lift every one out of the deep pit of darkness in which their privation had involved them. He spoke enthusiastically because he felt enthusiastically. He had been engaged twenty-five years in this work, and had tried to do something towards improving the methods of raising this question into the prominence that it ought to occupy in their national education. The School Boards of the different towns of the kingdom had it in their power to establish schools for the deaf and dumb, if they had only the interest and the earnestness to do so; but he was sorry to say that in more than one case with which he was personally acquainted, the increase of the rates was made a great obstacle he knew with working men and the mass of the population; and he believed that this opposition originated in their ignorance of the matter, and if they understood it thoroughly, their anxious hearts would be so stirred that they would willingly give part of their last shilling rather than the children should be brought up in this miserable degraded state. The thing had to be impressed not merely on the Government, but on all the constituencies of the country, especially the constituencies of large towns, until it was taken up, and once it was taken up and carried on the day would soon come when they would wonder that they had delayed so long in this matter, seeing the results were so great.

Mr. JABEZ HOGG, M.R.C.S., said he had taken a great deal of interest in this question, and he would urge on the meeting, and he hoped it would go forth from to-day, that the word "dumb" should be dropped and the term "deaf mute" adopted instead. He had found numbers of persons who really did not understand the question which had been discussed so ably that day. One of the speakers complained that there was great difficulty in getting School Boards to take up this question, but it had been forgotten that the fault could scarcely be attributed to the School Boards, that it really lay with the Guardians of the Poor. Before the Education Act was passed there was an Act, during the time of William IV., with regard to dealing with the poor, enabling Guardians to pay for the education of the blind, deaf mutes, and other afflicted classes, but that Act had been almost a dead letter in this respect, simply because we had not got educated ladies and gentlemen, ladies in particular, who had time for these matters, to go to the Board of Guardians, and to take an interest in what was going on in parochial matters. If this were done that Act might be put into force, and sums of money would be granted, without increasing the rates in any way, for the education of these poor children. With regard to the question of treating these children, Mr. Dalby has said all that need be said, but from considerable observation he could thoroughly confirm the opinion that the oral system was the right one, and that the other should be discontinued entirely. It stood to reason that a child born completely deaf, or only partially deaf, would scarcely apprehend the movements of the lips of its mother in any way or shape, but such a child must be early taken in hand, and educated in a proper and intelligent manner as others were. The fact was, however, that these children became neglected at home, were very much in the way, and the parents themselves hid them from the School Board inspector, and kept them out of sight, that they might not be compelled to take some action in the matter. If they were really taken in hand, and taught, a wide field would be open to these

children in every department of literature, science, and technical matters, far beyond anything which could be possibly done by any sign teaching. This sign teaching after all was a very limited matter, whereas the oral method would bring a deaf child as forward as one who could hear perfectly. With regard to the early introduction of this matter, it might not be generally known that an eminent actor, Mr. Buckstone, was so deaf that he could not hear a word. He had attended him for some years for other affections, and he told him himself, twenty years before he died, that he could not hear a single word uttered on the stage, and that he entirely depended on the movements of the lips of those with whom he was acting. That shewed what could be done by an intelligent man, and what could be done for those children who were now allowed to be a burthen on the State.

Mr. SCHONTHEIL (Director of the Jews' Deaf and Dumb Home) said, Mr. Van Praagh had dealt at some length with the question of what was often called "internates or externates"—whether it was preferable to have children in an institution, or boarded with their parents or other people. This was a very important question, and volumes upon volumes had been written upon it. He did not know of anything of importance in the English language on this subject, but in almost all other languages he could cite most excellent writings on the subject, the essence of all which was about this: They all agreed that it would be most desirable that a deaf child taught on the oral method should be taught in a manner not to know even that there was another deaf and dumb child in the world, because it was beyond doubt for such a child to associate with other deaf and dumb children in the cause of instruction, injurious, more or less, according to the quality of the school, and other conditions. This was very desirable, but practicability was another thing altogether. If it were practical to have children taught in that way it certainly would be very desirable, but directly one came to look into the matter it would be found to be utterly impossible. The

deaf and dumb children now in the schools were recruited from all quarters of the land; there was no chance whatever to have them boarded with their parents, and even where there was the chance, the parents were often of such a character as did not at all facilitate the education of the children. The only other suggestion was, to board these children with strangers, and he had seen such schools conducted admirably, but only in small country places. For instance, in Freiberg, in Germany, they were excellently cared for, because it was a small place, the teacher could superintend them properly; and families were to be found who took in the children, not for the sake of gain, but really prompted, in many cases, by philanthropy. On the other hand, he had seen the same experiment in other places, where it had not been at all successful, and the children instead of learning to speak as the teacher expected, from being continually mixed up with other children, did nothing of the kind; on the contrary, both the children and parents, instead of teaching them to speak, learnt to communicate with them by signs. Therefore, though he should heartily congratulate Mr. Van Praagh if he succeeded in this plan, he must say, after some experience, having been a teacher for more than twenty years, in different parts of Europe, that he should strongly recommend the internate rather than the externate system. He understood Mr. Dalby to say that in the case of a cleft palate nothing could be done for the deaf on the German method. Now, he had been teaching for the last three years, not a child, but, what made it very much more difficult, a young man of twenty-eight who had a cleft palate. He had the benefit, it was true, of all the medical aid that could be given in modern times, but he was now able to speak, so that his friends and acquaintances really understood him.

Mr. Dalby remarked that if he had been operated on, of course he ceased to have a cleft palate.

Mr. SCHONTHEIL said, the gentleman referred to had an india-rubber palate. He could cite another case which

occurred in Holland, where a person came to him and spoke so well that he had not the slightest idea that he had a cleft palate. He mentioned this in the hope that medical men, if such cases came under their notice, would first do all they could for them themselves, and then send them to a good teacher of the oral system. Another speaker had said that deaf and dumb children should be thoroughly examined by an aurist. In the institution which he presided over that was done, and throughout Germany it was done invariably, and in fact no child could be admitted to an institution without having been first examined by an aurist. Not only so, but there was a regular conference between the medical man and the teacher, so that the latter might be put in the way of treating the case. Lastly, he would insist on the necessity for the teachers being thoroughly well trained. It seemed to be a general idea that teachers of this system might be manufactured in the shortest space of time, and that any one almost might do it after a little training, but this was an entire mistake.

The CHAIRMAN said Mr. Van Praagh, the Director of the Oral Association, had in the room at present a class of his deaf children, and had time permitted there would have been an opportunity of a very instructive exhibition ; as it was, he would be glad to show those children as far as the time would allow, and those who were so interested as to devote a little more time in Room No. 2 of the Educational Department, which belonged to the Ealing Society, and was open to all kindred societies to exhibit classes of deaf children. The Ealing Society proposed to exhibit their children two days a week, Mr. Van Praagh, Mr. Schontheil, and Mr. Pearson were going to send classes of their children, so that, if possible, they might have a living class each day of the week during the remainder of the Health Exhibition, except during the holidays. He hoped this would be taken advantage of by all who were interested, and by many who were not yet interested, in this matter. For two afternoons he had been

spending some three hours in that room, and the number of interesting and interested persons coming in had been beyond his expectation. It was very difficult to get people to take even a little trouble to go and see a school a few miles in the country, or even to see one at their very doors, unless they took a special interest in the subject; but whereas there were thousands and hundreds of thousands of persons coming to that Exhibition, and as they had only to open the door to see a class of deaf children being taught, he was sure that tens of thousands would be interested in this subject, whose attention had never been drawn to it before. It was also very pleasing to his mind to find that all these societies were able to meet in the same room on the same ground, in order to make this the national system of the country. Mr. Van Praagh spoke of eight years as the proper course for the teaching of deaf children; now by the Education Act not less than eight years was the obligatory time for all hearing children, unless they passed out by examination at an earlier age; and surely it was only reasonable that at least as great a time should be allowed for those who had lost a sense, who wanted a sense, as those who were in possession of their full senses—in fact, far more desirable. In America, where they were behind England in method, they were vastly before us on this point; for in some of their schools they carried on their education from school to college, and he knew one young man, who was then in his twentieth year, of special education. They would be very well content in this country, as, at least, the first move, if they could get the Education Department to undertake that all deaf children should come to school, and remain at least eight years. At the present time, no cognizance whatever was taken of the deaf by the Education Department. He quoted those words from Mundella, the head of the Department, in answer to a deputation, of which he formed one.

Mr. JABEZ HOGG said, under the Act of William IV., those children could be educated up to sixteen years of age.

The CHAIRMAN said he was perfectly aware of what Mr. Hogg said. It was not that there was not a possibility of their being educated, but there was no compulsion. It was perfectly true that Boards of Guardians could do it if they liked; it was also quite true that School Boards could do it, or any other properly constituted school authority; but here came the difference between the deaf and the hearing. If there was a single child outside education who could hear, the Education Department in London came down, and said, "You are not educating the proper number of your children, you are not educating up to the Act of 1870;" but if every single deaf child were allowed to be uneducated, the Department took no notice whatever of it. Here he might very properly press the emphatic words used by Mr. Arnold in describing the condition of the deaf mute; he would not attempt to weaken the forcible words he had used, but would simply refer to the figures. Taken roughly, the total of those of the deaf educated, and now being educated, all over the world, under any system whatever, was about 90,000 young and old; whilst the total uneducated, who had never been at school, and never could go, because there were no schools in those countries, was about one million. Out of the million, he deeply regretted to say that 2000 were in the United Kingdom, and that he considered a disgrace to a country which prided itself on having a national educational system. Mr. Dalby had rather questioned whether the pure oral system was the best for all children; he would not go into the question, but leave it to doctors and medical men, to whom they were especially grateful for taking up this question. When Mr. Dalby read his interesting and most able paper before the Social Science Association in the year 1871, the oral system of educating the deaf was but little known amongst the medical profession in this country, or, if known, it was held in reserve; for amongst the many whom he consulted he could get no assistance except from two. He was very glad, therefore, to acknowledge the fact that now the medical profession

were leaders in this great movement ; and on the question of whether this system was the best for all children, he would call attention to the experience of Mr. Arnold, who had taught both ; and to that of the Abbe Tara, who at the Congress of Milan announced that, having been a teacher of the combined system, he was now one of the most enthusiastic practical and successful teachers of the pure oral system, and his experience in writing on the subject could be obtained by any one who would call at 289, Regent Street. He laid it down that this system was the best for all who had brains enough to be educated in any system whatever. There were, of course, some who could not be educated on any system, but they could be taught more on this system than by signs. He had not time to quote Dr. Langdon Down, and those eminent authorities, but there was nothing which so brought into activity the mental powers as speech, even of the weakest, both of the deaf and hearing. In conclusion, he would say in reply to Captain de Bisson, that although he had a heavy moustache and beard, he had the misfortune to have a deaf child, who understood him quite as well as she did her mother, and that amongst many hundreds of children in various countries who were taught on this system, it had never been found that the moustache and beard of the speaker made any difference as to being understood by those who had ever read from the lips of persons who had a moustache and beard.

Mr. VAN PRAAGH said he desired to return thanks for the hearty co-operation of those representing other kindred institutions, who had joined in making the Conference so successful. With regard to Mr. Schontheil's observations, he begged to say that since 1869 he had boarded children in London, and there were now present parents of some of the children who could testify how pleased they were with the treatment those children had received. It was not a theory, therefore, but a fact. He also wished to say that no pupils were admitted without a certificate from Mr. Dalby, who not only examined them to see whether they

were fit subjects for the Association's School, but continued to examine them occasionally to see if there were any improvement in their hearing.

Captain DE CARTERET BISSON then moved a vote of thanks to the readers of the papers and the Chairman, which was seconded by Mr. A. H. Moses (Hon. Sec.), and carried unanimously.

A short demonstration was given at the conclusion by some of the pupils from the School of the Association for the Oral Instruction of the Deaf and Dumb, 11, Fitzroy Square, W.

ELECTRIC LIGHTING

IN

RELATION TO HEALTH.

CONFERENCE BY THE SOCIETY OF TELEGRAPH-ENGINEERS ON FRIDAY, JULY 4th.

ARTIFICIAL LIGHTING IN RELATION TO HEALTH.
THE PHYSIOLOGICAL BEARING OF ELECTRICITY ON HEALTH.

ELECTRIC LIGHTING IN RELATION TO HEALTH.

CONFERENCE ON FRIDAY, JULY 4TH, 1884.

THE CHAIRMAN, in opening the proceedings, said the Society of Telegraph-Engineers had come forward, in consequence of an invitation from the Executive Council of the Exhibition, to conduct this Conference, which it was their desire to make bear upon the main subject of the Exhibition. In the columns of a leading newspaper there had been some remarks as to the difficulties which must sometimes be found in making out the connection between the subject of some of these conferences and the laws of health; but, with regard to this particular subject, there would be no difficulty whatever in showing that there was a close connection between the subject of electric lighting and the health of the public generally, whether it were in the large, crowded workshops of the country or the homes of the people, where many have wished to have the electric light introduced; though their hopes in that direction might perhaps have been a little greater a year and a half or two years ago than they were at present, still there was reason to believe that those hopes would soon be revived again.

ARTIFICIAL LIGHTING IN RELATION TO HEALTH.

By R. E. B. Crompton.

In early times but a small fraction of our forefathers' lives was spent under artificial light. They rose with the sun and lay down to rest shortly after sunset. During the long winter evenings they sat round the fire telling stories and singing songs of love and war ; the fire light was sufficient for them, except occasionally during grand feasts and carousals, when their halls were lighted by pine wood torches or blazing cressets. But, as a rule, after sunset they lived in semi-darkness.

From that early period, as man has advanced in civilisation, in the thirst for knowledge derived from books, and in following the gentler pursuits which demand an indoor life, there has been a steady increase in that fraction of our lives which is spent under light other than that of the sun. But the improvement in the quality of the artificial light has been very slow. The ruddy lights and picturesque shadows so faithfully handed on to us by Rembrandt's pictures show us very graphically what our poets have called "the dim glimmer of the taper" of those days. A few years before the introduction of gas Argand, by his improvements in the burners of oil lamps, enabled our fathers to see for the first time a comparatively white light, but as far as the matter we to-day propose to discuss is concerned, viz., the effect of artificial lighting, and more particular electric lighting, on our health, we need only consider the reign of artificial light as it commenced with the general use of gas and petroleum, for then and then only could it be said to affect our health.

Prior to the introduction of the electric light we have been accustomed to consider hours spent under artificial light as hours during which all conditions are less favourable to perfect health than they would be during daylight. Can we now hope to ameliorate this condition of things

through the agency of electricity? Before we can discuss this question I must point out to you the chief differences which exist between hours of work or recreation spent in daylight and under artificial light. In the former case we live in abundance of light. The sunlight itself exercises a subtle influence on our bodies; that mixture of heating and chemical rays which when analysed form the solar spectrum, and combined form the pure white light of daylight, is needed to enable all animal and vegetable organisms to flourish in the fullest conditions of healthful life.

In nearly all cases when the sun is up the functions of life are in the state of fullest activity and when it sets they sink into comparative repose. In daylight life wakes, in darkness life sleeps. In addition to the abundance of pure white light, the heat attending sunlight is only that necessary for health. The air remains unvitiated, except by our own breathing. On the other hand, when working under artificial light, we have these conditions all altered in degree:

1st, we have an insufficient light; as a scale of lighting by gas or by electricity which would be pronounced excessive at night time is still far inferior to average daylight.

2nd. All artificial lights, whether produced by combustion, as in the case of candles, oil, gas, and petroleum, or by the incandescence of a conductor by the means of electricity, produce heat; this heat, in proportion with the light afforded, is enormously in excess of the heat given by sunlight. Electricity, as you will see hereafter, is far the best in this respect, but even it is inferior to sunlight.

3rd. All these same illuminants, excepting electricity, contaminate the air, and load it with carbonic acid, sulphur, and other compounds—all injurious to the health and to the general comfort of the body.

It will be convenient to consider the effects—first, on our health generally; second, on our eyesight in particular. I have already called your attention to the fact that that proportion of coloured rays which when combined form white sunlight is that best suited to healthy life. It is necessary for that sufficient and proper stimulus to the organic changes which go on in our bodies, and which we

call a state of good health. The various artificial lights differ very widely from sunlight in this respect, that they are all more or less deficient in the rays at the violet end of the spectrum, commonly called the actinic rays, and which most probably exercise a very powerful effect on the human body. It is the want of a due portion of these violet rays which makes all artificial light so yellow. Even the light of the electric arc, which is richer in these rays than any other, is still on the yellow side of sunlight. The incandescent electric light is next best in this respect; next in order comes gas, petroleum, and the various oil lamps. No doubt some of you will challenge my statement that the electric arc is yellow. It has always been called a cold blue light. It is not so; it is only by comparison with the yellower light of gas or with the incandescent lamps that it appears blue; when compared with the sunlight reflected from a white cloud it will be seen to be distinctly yellow in tinge, but still both classes of electric light are far superior to all others in nearest approaching the white light of daylight, and thus satisfying the actinic action which our bodies demand.

Turning now to the comparative heating and air vitiating properties of artificial lights which we shall find it convenient to take together, I have here a table (Table A)

TABLE A, SHOWING THE OXYGEN CONSUMED, THE CARBONIC ACID PRODUCED, AND THE AIR VITIATED, BY THE COMBUSTION OF CERTAIN BODIES BURNT SO AS TO GIVE THE LIGHT OF 12 STANDARD SPERM CANDLES, EACH CANDLE BURNING AT THE RATE OF 120 GRAINS PER HOUR:—

Burnt to give light of 12 candles, equal to 120 grains per hour.	Cubic feet of oxygen consumed.	Cubic feet of air consumed.	Cubic feet of carbonic acid produced.	Cubic feet of air vitiated.	Heat produced in lbs. of water raised 10° F.
Cannel Gas	3·30	16·50	2·01	217·50	195·0
Common Gas	5·45	17·25	3·21	348·25	278·6
Sperm Oil	4·75	23·75	3·33	356·75	233·5
Benzole	4·46	22·30	3·54	376·30	232·6
Paraffin	6·81	34·05	4·50	484·05	361·9
Camphine	6·65	33·25	4·77	510·25	325·1
Sperm Candles	7·57	37·85	5·77	614·85	351·7
Wax	8·41	42·05	5·90	632·25	383·1
Stearic	8·82	44·10	6·25	669·10	374·7
Tallow	12·00	60·00	8·73	933·00	505·4
Electric Light	none	none	none	none	13·8

prepared by Dr. Meymott Tidy, which shows the oxygen consumed, the carbonic acid produced, the air vitiated and the heat produced by the combustion of certain bodies burned so as to give the light of twelve standard candles, to which Mr. R. Hammond has added the heat produced by a 12-candle incandescent electric lamp. From these figures you will see that the air of a room lighted by gas is heated twenty times as much as if it were lighted to an equal extent by incandescent electric lamps. When arc lamps are used the comparison is still more in favour of electricity. You will be surprised to see from the table that our old friend the tallow candle, and even the wax candle, is far worse than gas in the proportion of air vitiated and heat produced, and you will be disposed to disbelieve it, but the fact is that so long as candles were used light was so expensive that we were obliged to be content with little of it; in fact, we lived in a state of semi-darkness, and in this way we evaded the trouble. It is only since the general introduction of gas and petroleum that we have found what an evil it is.

It is not unusual, in fact we almost always find the upper stratum of air of the rooms in which we live heated to 120 degrees after the gas has been lighted for a few hours. We have grown accustomed to this state of things, and are not surprised that when we take the library ladder to get a book from the upper shelf we find our head and shoulders plunged in a temperature like that of a furnace, producing giddiness and general malaise. If you look again at the table you will see that each gas burner that we use consumes more oxygen and gives off more carbonic acid, and otherwise unfits more air for breathing, than one human being, and it is this excessive heating and air vitiation combined which are the main causes of the injury to the health from working long hours in artificial light. I could go on for a long time giving instances of the fearful state of the atmosphere of our large public buildings as well as of our private homes after the gas has been lighted for a few hours, but this paper is not intended as an on-

slaught on gas; moreover these ills are so well known to nearly all of you that I need not bring them more prominently before you. I will only take one instance, viz., that of the Birmingham Town Hall, which has been lighted alternately by gas and electricity.

During the grand Birmingham Musical Festival, which was held in that hall two years ago, some careful experiments were made to show how the orchestra and audience in the hall were affected by the two kinds of lighting. The gas lighting was in the form of several huge pendants suspended down the centre of the hall. The electric lighting was in the form of clusters of lights placed on large brackets projecting from the side walls, with two central pendants spaced between the gas pendants. The candle-power given by the electric light was about 50 per cent. in excess of that given by the gas light, the degree of illumination by electricity was consequently very brilliant.

It was found that when the gas was used the temperature near the ceiling rose from 60 degrees to 100 degrees after three hours' lighting. The heating effect of the gas was, therefore, the same as if 4230 persons had been added to the full audience and orchestra of 3100. Similarly the vitiation of the air by carbonic acid was equal to that given off by the breathing of 3600 additional persons added to the above audience of 3100. But on evenings when the electric light was used the temperature only rose one-and-a-half degrees during a seven hours' trial, and the air, of course, was only vitiated by the breathing of the audience. The further experiment was tried of giving to every member composing the large orchestra a printed paper of questions asking him how the new mode of lighting affected him or her personally, and I have here 265 replies to those questions. They are very interesting. I will read a very few of them out to you.* From them you learn

* *The following are some of the answers to Mr. Crompton's questions to the band and chorus:*—

"Well lighted, the atmosphere of the room greatly improved, and the equal temperature of the whole building has greatly diminished the risk of taking cold from the draughts in entrance and exit."

that without exception the comfort and general well-being of this large orchestra was increased enormously by the use of the new illuminant, and it is reasonable to suppose that the comfort of the audience was increased in an equal degree. I must here add that I have to thank Mr. Henry Lea, of Birmingham, who conducted these experiments, for kindly allowing me the use of his papers. Now, we all of us know that the times when we suffer most from the effect of artificial light is in crowded places of public amusement, which are at the same time brilliantly lighted. Many of us are unable to go to the theatre or to attend evening performances of any kind, as the intense headache which invariably attends or follows our stay in such

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"Much more pleasant than on any other occasion, in fact I never saw a more brilliant light in any ball or concert room in my life. It is a great success, I should imagine."

"Well lighted, very much cooler, thus allowing *us* to warm to our work by our own exertions, and also to cool down by resting. A general satisfaction is expressed at the improvement of the comforts of the workers."

"At a comfortable, even temperature the light has not afflicted me in the least, although I sit in between four dozen, and on a line to the side gallery lights. The gas used to make me dim."

"I, as a member of the Festival Choral Society, think your improved light is a source of great pleasure to those of us that have to occupy the orchestra so often during the concert season."

"I have never been on the orchestra before this Festival, but I found the part of the orchestra I occupied was as cool as the floor of any previous concert that I have attended in this or the Wolverhampton Hall."

"Cooler and fresher, likewise the violin strings of my own instrument have not been subjected to variation in pitch or otherwise, as is often the case with gas, and think this is important on such occasions when a cool atmosphere is an acquisition to a body of instrumentalists."

"Lower in temperature, could see music books better. Freedom from oppressiveness—attended six previous Festivals, someone has fainted. I believe this has not happened this time."

"Very cool as regards temperature compared with the temperature when gas has been used to light the orchestra. Instruments have been better in tune with organ. Light excellent."

"Very much cooler than on former occasions, and free from that nasty gaseous vapour that made breathing difficult, and parched the throat and injured the voice."

places entirely prevents them. This headache we commonly say is inseparable from the heat and glare of the gas. Now, this phrase is not strictly correct. It is, no doubt, due to the heat of the gas and its air-vitiating properties, but when we use the word glare I believe we refer to the effect the gas light has upon our heads, and which effect is not due to excess of light. On the contrary, I believe if a far greater amount of light be given by the electric light without the heating and air vitiation being present such headache is never produced, although some of

"Very much cooler than is usually the case with gas. The light is very pleasant, being a cool white light, not trying to the eyes, always keeping the same colour, never jumping as I have found the case with other electric lights."

"Exceedingly cool and agreeable. Certainly one of the most pleasing reminiscences of the 1882 Festival will be the advantages of your electric light."

"Exceedingly comfortable, the light brilliant, at the same time of a character which does not cause any strain upon the sight. I mention this as I have weak eyes."

"Delightfully cool, and at the close of the performance but very slightly different in temperature than at the beginning. It is vastly superior to the old system of lighting by gas."

"Brilliantly and equally lighted; whilst from my elevated position on the uppermost seat by the side of the organ, had the hall been lit by gas the heat would have been simply unbearable."

"Very much cooler than on other occasions, even in the depth of winter; and situated, as I have been, within one seat of the top, where the atmosphere is usually unbearable, I have felt extremely grateful at the comparative coolness of temperature."

"Deliciously cool and comfortable, no comparison with any preceding Festival, the heat at the end of the evening being scarcely greater than at the beginning. There has not been one case of fainting near me."

"Remarkably cool; in fact the change from the shifting atmosphere under ordinary circumstances is wonderful. I sincerely hope that arrangements can be made to secure this lighting as a permanency."

"Much more comfortable in consequence of the substitution of the electric light for gas; it has been but very little warmer for the evening performances with the light than for the morning performance. I have sung in all the principal halls in London (including Royal Albert Hall, Kensington,) and have always found the orchestra quite unbearable soon after lighting the gas. I have pleasure in speaking most favourably of your light, and the comforts in every respect attending it."

the more tender headed amongst us will at first complain of the glare because they are habituated to associate plenty of light with great heat, great air vitiation, and other evils.

Indeed, so long have we been accustomed to closely associate brilliant artificial light with headache and glare, that we who are introducing electric light are most cautious not to give the full quantity of light which we could afford to give, and which would afford the greatest rest to the eye and greatest bodily comfort. I now come to the effect that light has upon the temperament. If we try the experiment in an assemblage of people of gently decreasing the lighting of the room, it will be found that the spirits of every one will be depressed just as the light is depressed, and, *vice versâ*, their spirits will be raised just as the light is raised. I have many times when conducting experiments of electric lighting on a large scale noticed this fact, and I have been led to the conclusion *that during hours of waking every person is benefited by increase of light up to the extent of full sunlight*, providing that this high degree of lighting is not attended by heat and by air vitiation ; and I must add that the source of light must not be from one or two brilliant points only, but it must be well distributed and not such as to cause dark deep shadows.

This leads me on to the subject of the effects on the eyesight of the electric light as compared with other lights. *Healthy eyesight demands a plentiful supply of light. It is the greatest mistake to suppose that a state of semi-darkness is good for our eyes*, unless they are defective, or recovering from the effects of past injury or disease. Whoever saw a painter, engraver, printer, watch maker, or indeed anyone the quality of whose work depends on the excellence of his eyesight, who did not desire a flood of pure white light thrown on to his work. I think I have the authority of oculists when I say that 19-20ths of the diseases of the eyes arise from working the eyesight long hours with insufficient light. Again, another great cause of injury to eyesight is the unsteadiness of most artificial lights. Much improvement has been made in the light of gas during the last few

years by the introduction of argand burners, and globes for the flat gas burners having much larger lower openings, so that the dancing and flickering batswing burner of five years ago is not now common in a good house. But even the steadiest of the modern gas burners is extremely unsteady as compared with the light of the incandescent electric lamp. Those of you who have been to the Savoy Theatre will have noticed the effects of the lights behind the scenes on the scenery itself. The light is so absolutely steady that it is comparable to sunlight. Hitherto I have said nothing as to the comparative excellence of the two forms of electric light, viz., the electric arc and the incandescent lamp. Both have their proper places. The arc light, which is the whitest in colour and most economical to produce, is not so steady as the incandescent lamp. It is therefore unsuitable for indoor use or for reading by, or for such occupations as require the maximum of steadiness. But it is well suited for the lighting of large buildings and public places. I am unaware if any experiments have been made as to the effects of brilliant arc lighting on the eyesight of men who have to work night shifts, as although the opinion of the workmen who have to work under it is unanimous in its favour, yet that opinion is more based on their personal convenience, due to their being able to carry on their work with facility almost equal to that given by daylight than with special regard to their health. The large sorting rooms at the General Post Office at Glasgow have been for a long time lighted by the arc light, and with a most beneficial result to the health and eyesight of the letter sorters and telegraph clerks. The former occupation is one which tries the eyesight very severely. The public generally does not know how the habit of writing the addresses on envelopes with pale ink and blotting it off rapidly before it has time to darken tries the eyesight of the Post Office letter sorters. So long as gas is used a powerful burner has to be brought very close to the head of the sorter, and under such conditions the eyesight fails at an early age. At Glasgow Post Office I am able to boast

that by the introduction of the electric light I enabled many of the more aged sorters who were commencing to use spectacles to do without them—and even I put back the clock of time, in enabling several who had used them for some years to discontinue them. I am aware that it has been alleged by the opponents of the electric light, whether interested or otherwise, that in many cases the intensity of the light has injured eye sight. I do not think any such cases can be substantiated. Many of us who are in the habit of experimenting with powerful arc lamps have had our eye lids temporarily affected by incautious exposure at too short a distance. Again, over and over I met with the complaint that if I stare at an arc lamp for a long time it will make my eyes ache; the obvious retort being why should you stare at the light? If you do the same with the sun you will be equally inconvenienced. Before such an audience as this, which is, of course, familiar with the beautiful electric lighting in the Health Exhibition itself, it is useless for me to enlarge on the many conditions of the electric light as it indirectly affects health. I may only name the many additional pleasures of the eye we get from its use. Our flowers in our rooms do not fade away, and are seen in their true colours. Our pictures or all coloured objects are seen to better advantage. I may mention one thing which would not generally occur to you, that in London certainly an electric-lighted house can be cleaned properly in winter. You may smile at this, but I assure you that the advantage of being able to turn a flood of light into your drawing rooms and dining rooms at six o'clock on a winter's morning, and this without taking away the freshness of the air, so that the whole of the cleaning can be finished as thoroughly as if done by daylight before the family comes down to breakfast, is one that must be experienced before it can be thoroughly appreciated. Again, the advantage to the health of our children is simply inestimable. No night lights, no matches need be left about; no gas turned down low is required. A child six years old can be trusted to press a button and so turn the

light off or on; the lamps being high and out of reach are not easily broken or over-turned, and the air of the children's nursery, even if the light be kept burning the night through remains pure throughout. Another indirect advantage due to the absence of heat is that it is comparatively easy to thoroughly ventilate and cool during the hot weather a room lighted by the electric light. The heat of gas placed high in the room causes such intense draughts when the windows are open that the discomforts and dangers of the draughts are almost worse than the discomfiture from the heat and vitiated air, whereas in an electric lighted room there is no difficulty in opening wide all the windows, the draughts produced being so gentle as to hardly be felt.

DISCUSSION.

The CHAIRMAN said it was very important in discussions at any such Conference that both sides of the question should be put forward, and therefore, if there were any in the audience who might be called opponents of electric lighting, or who would rather perhaps be spoken of as the representatives of the present state of things, he hoped they would take part in the discussion.

Mr. ALEX. J. S. ADAMS thought that although the advantages of electric lighting in the abstract had been ably treated by Mr. Crompton, a very important point appeared to have been disregarded. It had become a truism that electricity was the artificial light especially provided by nature, and in comparison with which other means were makeshifts; nevertheless, in his opinion, it was not sufficient upon an occasion like the present Conference, held under the auspices of the Executive of the International Health Exhibition, merely to advertise that well-known fact to the public. A discussion such as this ought to embrace wider ground, and take a more extended view.

Amongst the ills which afflict modern civilisation, not the

least were the effects of sewer gas and burnt coal gas; and yet, whilst much had been said and done in connection with the former, literally nothing had been done to counteract the effect of the latter, although the majority of our houses become during a part of every twenty-four hours containers of contaminated atmosphere; and hence, he thought, the point to be discussed was not so much the superiority of the electric light, but the whole question of artificial lighting, together with the steps best calculated to bring about the general adoption of electricity. To his mind the question of improved artificial light was one of national importance, and freight with difficulties, because, although the electric light wires might be led to people's very doors, no general adoption of the system could be looked for until tenants were assured of a fair return for their outlay, instead of being, as at present, dependent upon the pleasure or avarice of their landlords. It seemed to him not a little remarkable, considering the importance of the subject, that whilst nearly every necessary of life was under the paternal supervision of the Legislature, artificial light was the almost sole exception, save as regards the quality of the coal gas supplied.

No house would be considered habitable that had not an efficient water supply—and the law did not consider it sufficient that good water companies existed, the house *must* be supplied—and a ventilated drainage system. It was not sufficient that a main drain existed, the law compelled its application. And he would ask, Why draw the line at artificial light? why permit the continuance of lung and blood poisoning upon the present alarming scale? Formerly, in the case of sewage and of water supply, the masses of the people were content with what accidental circumstances provided, *i.e.*, the cheapest or none, until the State stepped in to protect folks from themselves, and from their landlords; the same necessity for legislation in respect to the provision of artificial light exists now. Let the actual owners of property be held responsible for the due freedom of their properties from atmospheric poisoning

in connection with gas lighting, and electricity, he thought, would come in by natural selection.

Mr. James N. Shoolbred remarked, that among the many advantages which the International Health Exhibition presented for the benefit of the community at large, in none, probably, was the movement so marked as in that which resulted in the atmospheric conditions of dwellings by the use of the electric light as an illuminant, in lieu of gas, oil, or candles.

The best thanks of the Society were therefore due to Mr. Crompton for the clear manner in which, in his able communication, he had pointed out some of these advantages.

There were one or two additional points, however, which he himself might allude to, as being of interest; and as having come within his own observation.

In the first place, with respect to the products arising from illumination by the electric arc. In the year 1879, the late Mr. F. J. Evans, assisted by Mr. A. C. McMinn, both of the Gas Light and Coke Company, carried out a series of experiments, at which he himself had assisted.

Almost at the same time Professor Dewar, F.R.S., had carried out a very similar series of experiments at the Royal Institution, the results of which were communicated to the Royal Society.

In both cases the experiments were made upon the hourly products of a small-sized Siemens lamp, carefully enclosed, for the nonce, in an air-tight box, duly provided with an air supply and an exhaust pipe. The result of careful analyses of the hourly products gave, in Professor Dewar's case an average of 7·6 grains of nitric peroxide, and in Mr. Evans' an average of 5 grains of nitrous acid. While a corresponding illumination (1,000 candles) by coal gas would have produced about 80 grains of sulphurous acid.

The hourly amount of carbonic acid given off by the electric arc was also found to amount to about ¼ cube foot, or one half of that given off during the same time by the respiration of an adult.

Shoolbred himself had added, he said, under the head of "Remarks," certain further information as to the illumination, and the hourly products thereof, of the several rooms selected, under both systems of lighting. These observations might possibly present a more complete comparison of the results, unaided by the artificial ventilation already referred to.

In addition to the above facts, it may be interesting to mention the testimony of the refreshment contractor as to the very marked effect of the electric illumination upon the more delicate of the viands, especially upon the lobsters. These, even in a room of the unusual dimensions of the large dining-room, become black and unfit for food after a lapse of three hours, under the influence of the gas products; while with the electric illumination these viands remained good for a much longer period.

It is satisfactory to learn, owing to the very marked improvement and increased comfort in these rooms where the illumination by electricity is in regular use, that the extension of this illuminant to the entire of the buildings of the Houses of Parliament is in contemplation.

Judging, moreover, from the great success which has followed the extensive applications of lighting by electricity, both for external and for domestic purposes, which the International Health Exhibition affords (as did also, in a more limited way, its predecessor the "Fisheries"), as well as from the large number of private individuals and of firms who, despite of the heavy drawback attending the special supply in each case of a generating plant, are providing themselves with this new illuminant, it is to be hoped, that before long some of our municipal authorities, gas owners though some of them may be, will, in deference to the growing demand, themselves become distributors of electricity.

Colonel MALCOLM, R.E., said he would try to pose as one of those who were contented with the present state of things. Mr. Crompton had given a very able paper, bringing together a mass of facts which might perhaps, by

labour, have been collected by any one of the audience for himself; but there were very few who would care to take the trouble, and many would not be able to get hold of all the data which Mr. Crompton had been able to collect. It was very clear that if the electric light was as easy to manage as he made out, everybody would clamour for it, and electric lighting companies would be doing a large and lucrative business. Apparently that was very clear to the authorities, for they took as much care as possible that everything should be properly regulated; and the point he wished to ask Mr. Crompton was, whether the electric light was really safe in the house? He knew what gas could do: it was able to blow out windows and things of that kind now and then; but still that, like the dynamite explosions, generally affected only the kitchen-maids; and he once saw a table set on fire by electricity, although it was in the hands of a very able lecturer. He wished, therefore, to know whether there was practically any danger, because he did not see any mention of this point in the syllabus, and it was of some importance when these great currents of electricity were brought into houses. Mr. Crompton had talked about the glare, and said the sun-light did not produce an unpleasant effect on the eyes, that the only effect was to stimulate the eyesight and do it good, and that the glare complained of with electric lighting and gas lighting was due to the heat, the vitiating products of combustion, and so on. He thought one cause of glare was a bright light proceeding from a small object. If the sun streamed into his bedroom through a small crack, it had a very unpleasant effect. What seemed necessary was to have a number of them well disposed so that if you could only get enough, so that the eye could be attracted to any particular one, he could understand the object of Mr. Crompton's remarks; but he fancied that one bright light, or anything that would be perpetually attracting the eye, would have the effect of glare, and would be very unpleasant.

Mr. GEORGE OFFOR said he had been recently en-

gaged in carrying out an experiment in connection with domestic lighting, at Colchester, where the electric light had been supplied to the public on very similar lines to those of the gas supply. If the opposition to the new illuminant was fairly represented on this occasion by one actual sceptic, and one very doubtful friend of the old system, he thought that electric lighting was not at all likely to suffer. The argument used by the speaker was, that there would probably be a rise of rent in the event of electric lighting being introduced into houses, which was probably the greatest compliment that could have been paid to the electric lighting interest; for if, by introducing the electric light, rents were to be raised, it proved indubitably that the light must be a very great improvement indeed. But was the same principle to be applied to everything else in the house? Would that gentleman refuse to put up a proper system of cleansing his cisterns, for example, for fear his rent should be raised when the landlord heard that he was getting purer water? The same principle might be applied to everything, until at last it was reduced to this, that in order to get the cheapest rent they must take care that the house was most injurious to health, and a most improper place for a dwelling. From his experience during the last few months, his impression was that the public were never so eager to have the electric light as they were at the present moment. The question had been asked of him hundreds of times since the opening of the Exhibition, "Why cannot we have the electric light?" and he must quote from memory a letter he had received only a few days ago from an inhabitant of South Kensington. That gentleman wrote to say they were anxious to have the electric light, but could not get it. A Provisional Order had been granted to a company for the purpose of lighting South Kensington, and could not he induce the company to part with it for a consideration, and carry out the Order to give them the benefits of electric light. He had also applications from residents in some of the great squares, saying they could not imagine why they were

unable to get the electric light. There were practical difficulties, and it was to get over those practical difficulties that the installation at Colchester had been carried out. Much as people wanted the electric light, they were not prepared to put down the necessary plant in their houses; but if they could have a wire carried into the house like a gas-pipe, which gave them electricity in the same simple way that they got their gas, and were charged so much per quarter for the quantity of electricity they used, any amount of business might be done. The practical difficulty was how to do this. In London, where were there houses which had the accommodation for putting up gas or steam engines, and dynamos or storage batteries? Therefore they must be supplied by means of central stations; and this was what had been done at Colchester. He mentioned this because of its interest at the present moment, although it was hardly in the limits of a Conference dealing with the effects of electric lighting on health. But he really thought they were engaged in killing a dead donkey over again when they got up and addressed an intelligent audience on the subject of superiority of electricity with regard to health. It was admitted on all hands that it was superior, and the public were beginning to understand that it was not a question of whether electric lighting could be supplied at the equivalent of 3*s*., 4*s*., or 5*s*. per 1,000 feet for gas; for there were many who were intelligent enough to know that if they could save their doctors' bills—if, as a well-known universal caterer told him a short time ago, he could save £500 a year in whitewash—surely it would not be a question as to whether electric lighting would cost him just the same as the same amount of light from gas or other illuminants. The practical question was, could the light be supplied in a convenient way? That had now been done at Colchester. The experiment was a most interesting one, and proved perfectly successful. There they had a central station where the current was generated, and in different parts of the district there were other stations where it was stored, and from those stations it was supplied

to the houses by small wires, in the same way as gas from small pipes. If that system could be carried out everywhere, the problem would be solved; but it must not be supposed that there was any lull on the part of the public. The public did make a mistake, no doubt, two years ago, when they knew very little how the electric light was produced; as an illustration of which he might mention a joke which occurred at the Crystal Palace Exhibition, where a couple from the country, having asked the price of an incandescent lamp at one of the stalls, and being supplied with the lamp for 5*s.*, expended a box of matches in trying to light it, and then declared that the whole thing was a swindle. There was no doubt an idea at one time amongst the public that the electric light could be supplied in as simple a way as that; but there was no doubt now that they were perfectly prepared to have it, if you could give it them with the same convenience as gas. The public must not suppose there was any doubt about having the electric light if they chose, but they must find the money in order that the new illuminant might be provided by those who knew how to do so if the means were placed at their disposal. If the public would not find the money to purchase the plant, it was no use to expect that the light could be supplied. The gas interest had an enormous amount of capital at their disposal. Let the public thoroughly know that the electric light could be supplied with all its advantages; and if they had faith in their opinions, and would subscribe the funds, there were gentlemen in that room who would undertake that the whole Metropolis was well lighted.

Mr. J. SWAN said he could give a very direct answer to the question put by Colonel Malcolm as to the safety of electric light. His own house was lit with incandescent electric lamps, and had been so lit for more than a year. During that time it had been under the control of servants, just as gas lighting ordinarily was. There had never been any accident from fire or from shocks, but they had had a perfect light, without hitch or discomfort of any kind; in

fact, they had experienced infinitely more comfort than could possibly have been obtained from either gas or lamps. If Colonel Malcolm would come and see him, he would give him a hearty welcome, and substantiate these statements. The speaker following Mr. Crompton had said that if electric light was of such great importance to health as had been contended, then it was the duty of the Legislature to see that the public were put in possession of the benefits it was capable of conferring. He seemed to have the impression that the whole matter of lighting had been neglected by the Legislature, not only as regards electric light, but also as to gas light. This was not so. When power was granted to a gas company, the Legislature required that the gas should be of a certain quality as to freedom from sulphur and other deleterious agents, and also as to illuminating power. It was also a fact that the Legislature had intervened in the matter of the public supply of electric light; but he was afraid that this intervention had so far not been attended with happy results. With an honest intention on the part of Mr. Chamberlain and the Board of Trade to help forward the introduction of electric light, on the indisputable assumption that it would be a public benefit if it could be adopted generally, an Act of Parliament was introduced to protect, on the one hand, the public from extortion, and any evils which might possibly grow out of a monopoly; and, on the other hand, companies were disposed to supply the public with this better kind of light. But the Act had not been very successful in the attainment of these objects. It had not sufficiently recognised the fact that electric lighting was an infant and required nursing, and not a dangerous adult in need of a "strait jacket." The Act had in fact *discouraged* electric light companies from attempting the supply of electric light to the general public on a large scale, and was a chief cause why more had not been done in that direction. It would be a good thing if one of the practical results of that Conference was an endeavour to obtain such alterations in the Act as would make it more of a stimulus,

or less of a hindrance, to the extension of electric lighting.

It was clearly evident that the public were desirous of having electric light supplied to them. They knew it was of the utmost advantage to cleanliness and health. He had received many communications similar to that mentioned by Mr. Offor, asking why electric light could not be supplied to this and that locality. His reply was, that in the face of an Act of Parliament, which, in the endeavour to protect the public against possible but remote dangers, had so embarrassed a new and undeveloped enterprise by excessively hard and onerous conditions, sufficient inducements did not exist to lead capitalists to invest their money in extensive electric lighting operations of a pioneer character.

It was most desirable that some alteration should be made in the Act; in the public interest, and especially in the interest of the public *health*, an effort should be put forth with that object.

Mr. T. R. CRAMPTON said the whole question of electric lighting had been very fully put forward by Mr. Swan. It had now become mostly a commercial one. Its practicability had been sufficiently solved, at least so much as to justify the public to come into it, if the inducements to do so were sufficiently fair as between buyer and seller. But the Act had peculiar clauses in it. Public companies had perhaps to go through various vicissitudes before they received any interest on their capital; but when they had made a success, a town or a corporation could come forward and forcibly purchase the rights of the company—not on so many years' purchase, or on any terms which would give the shareholder an equivalent for his investment but the purchase could be made at the cost of the material on the ground. No progress could be made in the face of such conditions. He might say that, so far as he had watched it, there was no need to go into the question of health—that was solved, and the question of convenience was solved. We all know what a beautiful light it gives; and what was perhaps a greater question than all to the

female portion of the population, viz., that of cleanliness, that was also solved. He could give a case where the cost of taking down pictures and furniture to clean every year had been more than the whole cost of the gas supplied during the time. Any one who thought about it would be glad to give double the price of gas for the electric light, and he often asked his friends why they did not give it. The only answer he received was that they could not provide and look after the plant necessary for its installation. Doubtless it took a certain time to introduce anything, however good it might be; and he believed no long period would elapse before companies would be in a position to supply private establishments.

Mr. GREENHILL said he knew a gentleman in Scotland who had had the electric light in his house for nearly two and a half years, and he told him a short time ago that if it cost five times as much as it actually had done he would not abandon it. It could not be said that this gentleman sacrificed his pocket for the sake of electric lighting, because he did not think his knowledge extended much beyond the difference between a dynamo and a lamp.

Last week, at Stockton-on-Tees, a gentleman had told him he had had the electric light in his house for six months, and if gas were supplied free he would not abandon the electric light. He believed the public were now more anxious than ever for the electric light; and as to their subscribing money to carry it out, they had subscribed a very large amount, but, unfortunately, in many cases it had not been applied in a manner which had borne satisfactory fruit. The electric light had passed through the same stage as railways had on their introduction, namely, the speculative stage; and he believed that now electricity was on a firmer basis than ever before, and in a short time he was certain that the electric light would become general.

Mr. A. J. S. ADAMS, in reply to a previous speaker, said that he was a great advocate for the adoption of the electric light, but that the question remained, how was its general

adoption to be brought about? It seemed to him that the delegate from Colchester and he were looking at the question from two different points. The former had in his mind's eye people who could and would afford to throw away their gas brackets in favour of electric light fittings; whilst his (Mr. Adams') previous remarks were on behalf of those who would not or could not afford that expense.

Mr. WILLOUGHBY SMITH said that a great deal he had heard to-day was merely a repetition of what he had heard a few years ago. One gentleman had said that the public were clamouring for electric lighting, but that they seemed reluctant to pay for the same. He thought that rather hard on the public, considering that within the last two years they had subscribed no less than twelve millions of money for electric lighting, and have not yet seen any result for such an enormous outlay.

A great deal has been said as to the luxury of the electric light by those who were fortunate enough to possess the same in their own houses, and no doubt it had, as had been stated, many advantages over other systems of lighting; but there are always two sides to a question, and this case was no exception to the rule. He had not the electric light in his own house, but had the misfortune to live in the next house to a gentleman who has. He said "misfortune," because at first not only did each gas light in his and the neighbouring houses diminish in intensity, but also responded to every stroke of the gas-engine, which state of things was only altered by a separate main being laid to supply the engine; but now the click of the engine and the burr of the dynamos was very annoying, especially as he could no longer enjoy, as he used to do, the quietude of his own garden. The engine, he believed, was called a silent one. If it were considered so, he often wondered what a noisy one must be like. Knowing what he did of the electric light, he would freely give three times the amount he now paid for gas to have it in his house, but he would be sorry to indulge in the luxury to the annoyance of his neighbours.

It had been stated that every person admitted the superiority of the electric light over all other artificial light, but is that so? He thought not; for a few days since a lecture was delivered in that very room by a gentleman who extolled the advantages of candles, and informed his audience that the inventor of the candle would soon celebrate the eve of his hundredth birthday with an illumination of candles, which would eclipse even the electric light. Now, if the figures Mr. Crompton had given were correct, he would certainly implore him, on the ground of humanity, to write at once to that gentleman, and caution him against such a suicidal act as to place himself and friends in such a poisonous atmosphere as would be created by such an illumination.

Mr. R. E. CROMPTON said his remarks would hardly be a reply to a discussion on his paper, as there had virtually been none. Every one seemed to think that what he had urged on the advantages of electric lighting in regard to health was well known and agreed to, and that in bringing so prominently forward the disadvantages of gas and the older illuminants he had been flogging a dead horse; but the fact was he had written his paper to order, one of the objects of the Conference being to bring very strongly before the public the fact that electric lighting had such enormous advantages; for although many persons might be aware of them, the facts were not known to all, and reiteration might do a great deal of good, and could do no possible harm.

After all, as Mr. Offor had said, the reason why people did not have the electric light was because they would not pay for it at present; but if it were a thoroughly acknowledged fact that in paying for the electric light the public were paying for health at the same time, and that every hour of a man's life spent in a room lighted by gas tended to shorten his life and abridge his powers of work, in time the public might change their minds sufficiently to cause them to spend their money on healthy light, as they were now so largely doing on the sanitary and other arrangements necessary to make healthy houses.

In reply to Colonel Malcolm, he would be indeed flogging a dead horse if he was to keep on reiterating the smallness of the danger due to the electric light as compared with that due to gas, and the matches inseparable from its use. The dangers were in fact infinitesimal; those from fire risks were extremely small if the most ordinary precautions were taken to provide conductors of sufficient section and insulation.

The insurance companies had drawn up rules which were very stringent in respect to fire risks; and if these rules were adhered to they would certainly prevent fires occurring.

The dangers of life were practically confined to those from the use of arc lighting currents of extremely high tension, which would not be used in domestic lighting.

Several speakers had asked the question how it was that electric lighting was not more generally used. This was a very complicated question to answer. No doubt at the time of the formation of the electric light companies, so many of which had since come to grief, the public imagined they would very soon get the electric light supplied in their houses much in the same way as gas is supplied. The causes of their disappointment were so many, and in most cases so distinct from the subject now under discussion, that he would only say that in his opinion the main obstacle to the general distribution of the light was solely that of want of sufficient capital to carry out installations for the supply of electric lighting on a large scale from house to house. Most of the money subscribed to the companies when they were first formed had been spent on experiments, and no doubt in many cases in attempting to perfect inferior impossible systems. At any rate, there was not sufficient left to carry out the above object. Single self-contained installations were only possible in a limited number of cases, on account of the great difficulty in finding space for the gas or steam engine. In the confined space available in towns it was a matter of great difficulty to make the generating plant perfectly silent and inoffensive to the neighbours. It was quite true that silent gas-engines

were not always perfectly silent, although he had succeeded in making them so by taking extra precautions against the communication of noise and vibration. No doubt there would be some increase in the number of such self-contained installations, but he hoped that the next step would be in the direction of small co-operative installations, six or seven houses being served from one centre. This would make the cost of generating the light considerably less than is the case when each house has its own generating machinery; and if a few such co-operative installations could be got to work he thought it would be the means of greatly restoring the public confidence in electric lighting as a commercial fact; but it must be clearly understood that the electric light could not be supplied at a cheap rate otherwise than on a large scale, and in order to enable the necessary work to be carried out the confidence of the public must return to enable the necessary capital to be raised.

Colonel MALCOLM, R.E., said he was by no means an opponent of electricity, as he was only too anxious to get it; but as the Chairman had invited an attack, the only point he could hit upon was the one he knew was commonly urged in uneducated circles, namely, that of danger. He had elicited a very distinct answer to that question, which he hoped might prove of some service.

The CHAIRMAN said it was often necessary to enforce ideas which perhaps might be well known in certain quarters, but were not sufficiently generally known; and in fact changes of this sort could only be brought about in that way. They had heard something with regard to wax and tallow candles which would be new, no doubt, to many, for they had been accustomed rather to put wax candles before gas, and to say they would have nothing to do with poisonous gas, but would keep to the wax candles; but Mr. Crompton had shown that the candle was far inferior. He had just answered a question which had been put several times lately, and the same question was put to himself last night—why the electric light was not supplied

to the public; why the electric light companies did not make it known that they were ready to supply the light to a small district of a few houses? He was glad, therefore, that Mr. Crompton had informed them that the companies were perfectly ready to supply a small district; and that it was within their power to do so anywhere, provided they had not to cross a street, which was rather a difficulty in the way at the present moment. It was only the Post Office who had the right to carry wires or convey electricity along the streets; and it was only by special arrangement that powers could be obtained for crossing streets or laying down wires in the street; hence the necessity for a Provisional Order from the Board of Trade before anything of the sort could be carried out. With regard to the question of danger, that would be brought up more prominently in the Paper to be read in the afternoon.

[The Conference then adjourned for luncheon.]

At half-past two the Conference again assembled, when the following paper was read:—

THE PHYSIOLOGICAL BEARING OF ELECTRICITY ON HEALTH.

By W. H. Stone, M.A., M.B., F.R.C.P.

It is now about two years since I had the pleasure, in conjunction with my colleague Dr. Kilner, of bringing a paper before this Society, in which we tried to lay down some rudimentary basis for physiological measurement of electricity; and I am happy to acknowledge in beginning that the origin of that paper, as it is of this which follows, was due to a former President of the Society, Colonel Webber. He had clearly realised in what very great confusion the whole question of electricity as applied to physiological—I will not say medical—subjects was, and he asked me if I would undertake to do the best I could

with it. The former paper was only preliminary, and intended to clear the ground; even in this I cannot for one moment pretend to have reached anything like finality. A few more observations have been made by as accurate measurement as can be obtained, so as to lay, if possible, something like a solid foundation for what has hitherto been entirely built on sand.

Since the date of the former paper I have had the pleasure of reading one before the British Association at Southport; and the editor of *Nature* has kindly inserted three different notes, in which individual points have been brought forward with a view of just showing the line along which I was working, and thus enabling fellow-workers to keep pace with me. The notes in *Nature* occurred on June 14th and September 13th, 1883, and on May 15th of the present year.

In the excellent practical paper which we had this morning, which was followed by one of the most agreeable discussions I ever heard, a good deal of the ground was cleared which otherwise I should have attempted to cover, and I may therefore take you at once to the physiological relations, and I may say that I shall not speak about lightning accidents. Lightning of itself is a subject so large, and it has been so long known as a dangerous agent, that the whole afternoon would not suffice for describing what happens. I shall only incidentally speak of it when treating of high tension currents. The same thing applies to sight. The injuries to sight, no doubt from electric light, although ultimately due to electricity, depend more on the intensity of the light and the associated motions in space which light carries with it, than on anything which belongs to it as electricity. Therefore, perhaps I shall be excused from taking up that point, and so attempting to treat on more than can be done efficiently in the time allotted. We have in electric lighting two different things, the two extremes of the spectrum—we have incandescent lights, and we have arc lights. The dangers of the incandescent lights are evidently derived from heat vibrations, the

dangers of arc lights are as evidently due to actinic and ultro-violet vibrations.

Perhaps I may be allowed to mention a convenient appliance (for this Society always has been, and I hope will long continue to be, a practical Society), in which, with the assistance of Mr. Gardner, of Messrs. Baker's, of High Holborn, I have somewhat modified the usual goggles.

The goggles sometimes have to be used for incandescent lights, and sometimes for arc lights. They have blue fronts to them, which keep out the heat rays very fairly; they have also red sides. When I look at an incandescent light, and my eyes get irritable, and the conjunctivæ inclined to be troublesome, I use the blue goggles; when at an arc light I shut the sides down and use both. I strongly recommend these to electrical engineers.

We may now proceed to speak about the subject of my syllabus. It is there said that electricity, as at present used, is at once a source of danger, a possible cause of sickness, and a remedy. You will understand that my power of talking of it as a remedy on the present occasion will be very limited; and, even if I had the opportunity, this would not be the place perhaps in which to speak of it. What I shall mainly consider will be, in the intermediate space between the danger and the remedy, certain means of measuring the risks of danger, and obtaining something like a basis for definite facts. Of course the question of danger with electricity, excepting in the single case of lightning, has only arisen within the recollection of most of us, certainly well within mine. I was present as a boy, I am proud to say, at Faraday's lectures and experiments. I served as the subject for some few of them; and all that has occurred since, these enormous currents which we are now making use of, were of course then practically unknown. But while electricity has been making bigger strides than any other physical science, the so-called medical electricity (I abominate the term, for there is no such thing; but I mean electricity as applied to physiology,

and therefore to a certain extent to therapeutical pursuits and ends) has marvellously hung back, and it is certainly still in the ante-Faradaic period. For this I have given some reasons: one is in the syllabus, that the knowledge of physics and the knowledge of physiology is rarely united, and is to a certain extent incongruous, I might even say antagonistic. The mind of the physiologist is not the mind of the physicist, and there is occasionally a little heating from friction between the two. This I hope to avoid as much as possible to-day.

There is another reason for it. It is a good thing for the world at large, it is a good thing for science at large, when one very big man comes and occupies a field. He does all the work that can be required. He settles the induction, as Faraday used to say, and then he leaves the rest to the computers. This was done to a great extent for electricity by Faraday himself. But it sometimes happens that a man is too big for his place; and we had in physiology one of those men, Duchenne of Boulogne, whose work has not been properly appreciated up to now. But this work was not electrical. He experimented with a very rough induction coil; and I recollect him well in the Paris hospitals—a little man, energetic like a Frenchman, not grand to look at, but full of work—trotting about examining all the patients with this curious induction coil of his. It was a very bad coil, but it had the gift of exciting muscles; and by testing patiently and carefully for years a number of muscles individually with small pointed conductors by means of his induction coil, which was practically only an irritator, only an electric needle which he stuck into these muscles, he accomplished a great work. He isolated two or three distinct diseases not isolated before, but which are now well-known. That work was physiological, not electrical. That old-fashioned induction coil has been the means of what has been termed electric testing in physiological research. Now that induction coil is a very complicated, a very uncertain, and a perfectly unmeasured source of force. We do not know—at least we have not known—

the least in the world what it is doing. We know that it tickles up the muscles into activity, and we know that if they do not respond naturally, it is an indication of some pathological change in the human body. But that is not electrical; it has got the name of electricity without being electricity. As to electricity pure and simple, I am sorry to say I see great evidence that the medical world is somewhat behindhand. First of all I may quote a pamphlet which is not directly medical, in which the writer states: "Far less was it known—indeed it is only now beginning to be understood—that man himself is a magnet; that his blood and every tissue of his body is pervaded by magnetic influence; that he may be acted upon magnetically by magnets; that in some persons the magnetism disengaged by the contraction of the muscles is sufficient to deflect the needle of the compass" (magnetism, mind—not electricity); "that the health and comfort of each individual, his physical vigour and mental power, depend largely on his magnetic condition, and his relation to the magnetic forces around him." Every one of these statements, speaking strictly, is false; I absolutely and categorically deny that any one of them is true: on the contrary, they are the very opposite of the truth. Let us ask those who have to deal with Thomson's galvanometers, if they even walked into a room, being magnets, what would become of the Thomson galvanometer?

Then I go a stage further. In a medical periodical the other day I found a review of a work on electrical medicine. The first statement which it begins with, as a sort of flourish of trumpets, is, "There is no mode of measuring alternating currents." I have not been able to recover that extremely foolish statement, and therefore I will not say where I saw it, but see it I undoubtedly did. Only on the 28th of June an article on galvanic batteries for medical purposes appeared. This is written very much more *bonâ fide* than the others, and I dare say is in the main correct; but I find in this the following statement:—"The resistance of the body varies within wide limits—300 to 100,000

ohms." These are wide limits; I think they are wider limits than the Society of Telegraph-Engineers would be willing to sanction. If you turn that into current or potential, see what would happen to the patient if during the experiment his resistance should vary from 100,000 ohms down to 500: the man would simply be burnt up alive. Therefore it is high time we should pay attention to this. Going a little further, in the same article we find: "Suffice it to say that the rheostats are conveniently made of telegraph wire well insulated in india-rubber, and the electrodes called so because the human body behaves like an electrolyte in the circuit." I did not certainly think electrodes were so called because the human body acts like an electrolyte in the circuit. But this is in the last number of a good paper on electric science. Is it not really too astonishing?

Now, to get something a little more precise. These come under the head of common errors or dangers. Sight you have permitted me to pass over somewhat perfunctorily, as it was alluded to this morning. As to those to life and health, I might begin by stating that it is perfectly clear, from Mr. Crompton's excellent paper, that for the powerful currents we have been using the accidents and dangers have been singularly few; but it does not follow from that that we have a right from our present immunity entirely to disregard them, or that circumstances may not arise when they would become a very serious matter. Here of course I take my stand; and I shall appeal rather to my friend the excellent President of the College of Physicians for confirmation as a physiologist, when, speaking of the causes of danger, I say it is obvious that they are not only one. When I say only one, I mean the familiar cause of danger which we all know in shock from lightning. An instance of such danger was the unfortunate man at St. Petersburgh who, being short-sighted, put his head too near where he was examining the discharge, and it struck and killed him. We know several such cases. The cause of these deaths is obviously shock. There is no

post mortem appearance found, and they agree with cases of death from concussion of the brain. But, taking them generally, very high tension currents, such as lightning, seem to kill, by a shock affecting the nervous system and brain, instantly. Now, many of the deaths which have taken place have not been instant, and we must go further afield to find the cause of death. Two other causes of death seem to be indicated. There may be actual catalytic action, actual decomposition of the tissues of the human being; that decomposition I have once seen to occur. It takes place of course at one of the poles; in this particular case at the negative pole. Secondly, you may have that wonderful coagulation of the vessels of the body during life which the great Virchow has not only pointed out, but has brought home and made a household word to every physician. Now, under the definition of thrombosis of one of the larger vessels, such as the heart or the lungs, or the large system of arteries or veins, I believe some of the deaths which have taken place from electricity to be included. At any rate, from the very mutilated details which I can collect as to the death at Birmingham, where a foolish player in the orchestra seized hold of the terminals, it seems to me very much like a case of thrombosis. He became livid, and lived about three-quarters of an hour, which in a case of death by lightning would not have occurred. There was apparently a mixture of asphyxial and thrombotic symptoms, which I have no doubt the President of the Royal College of Physicians will recognise. Therefore I think we must be alive to that as a possible accident. But no doubt most of the cases have been from shock or syncope. The only accidents I have down of which I can get any details are the musical hall case at Birmingham, which I have disposed of, because the papers said the man lived three-quarters of an hour, and therefore it could not have been a death from shock; and then there was the celebrated Paris accident of two foolish boys or men who tried to climb over the wires; there was the Hatfield accident, and then there was the accident on the Russian

yacht. If any members of the Society can give me the details as to what were the particular classes of machines employed, and whether the currents were continuous or alternate, what was the tension and also the period at which the unfortunate sufferers lived after receiving the shock, it would be most valuable.

Chief among common errors, let me name imperfect contact. Any person accustomed to electric measurements will see immediately that the very hopeless statement that the body varies from 500 to 100,000 ohms must be a question of contact—it cannot be anything else; and I believe the differences experienced in the early days of medico-electricity have been that the contacts have been to a degree imperfect that the experiments and all persons concerned did not in the least suspect. Everybody has known for a long time that the skin when dry is a very perfect insulator; in this country less so than in America—in fact, in that dry country insulation is infinitely more perfect than in Europe; and therefore Professor Holtz consents to send his induction machines to America, and will not send any more to England. We live in a fog, and walk about in a mist; we are a kind of aerial fish. In America, if you walk about during the dry season with your boots off and woollen socks, you can light the gas without any matches. In this country I am afraid matches must still be used. We are living in an epidermis of gutta percha; we are small ambulatory Atlantic cables; and, like cables, we certainly can be charged.

The first question which presented itself to me was how to get rid of this delicate, this very thin but singularly perfect insulation, which prevents contact and raises the resistance sometimes to 100,000 ohms. I thought simply first of making a hole in the patient, and some of my students allowed this. It was also done by Professor John Morgan of Manchester; but it is not agreeable, and on second thoughts I do not think I should allow it on myself again. I used the little hooks used by surgeons, called "serrefines." I passed them through the epidermis, and

the actual contact can be got in that way; but the patient objects, and I do not blame him. I have tried oleate of mercury, which is a good conductor, and that answers very well indeed; but, unfortunately, that is transferred into the patient, and mercury is a somewhat powerful agent. Then I thought of strong salt and water; and with strong salt and water I may honestly say I have succeeded. This method was brought before the British Association; but, besides a good conducting and harmless solution, it obviously showed itself to me that through an imperfect conductor like the skin—a variable conductor—the size of the contact must be geometrically infinite as regards any possible current it should have to transmit. That, I think, I have achieved by using one of these long leaden electrodes rolled in surgical fashion round the hand. That, with salt water underneath in some form,—say, a piece of flannel,—acted so well for my small currents that the skin resistance, and the cause of failure as I hold it to be, was brought down, if not to nil, to a minimum. The argument which I should rely upon here would be this. A patient of mine unfortunately died. I had examined him electrically before that sad event, and had got 1,100 ohms resistance by means of lead electrodes wrapped round his feet. After death, when the poor man could suffer no more from my researches, I passed two long silver needles, intended for curing aneurisms, three inches deep into the soles of his feet—the plantar muscles—that is to say, right through the epidermis into the muscular tissues; and, whereas the resistance had been 1,100 ohms through my large electrodes, it was 50 more through these long needles. Of course the 50 more was due to this, that I had been carrying the poles a little higher; the conductor was somewhat shorter, and I was passing the current through a little more human tissue than before, and the 50 ohms very fairly coincided with the extra distance. This showed that I had reduced the skin resistance, if not to nil, at any rate to a very small quantity. When these views met the eye of an excellent physicist and electrician, Professor Dolbear

of Philadelphia, he wrote me a genial, hearty letter, in which he said he should not deny the fact, but he thought a man with his feet wetted in salt water was an abnormal condition. He deserves great credit for the word "abnormal." There is no doubt about it; we do not all live with our feet wetted in salt water. In the same way the editor of one scientific paper told me if we do wet our feet in hot water the skin swells up and becomes puffed, the pores open, and all sorts of things happen; to which I feel constrained to reply, that if you wash your feet in water and soap every morning this does not occur, but after, say, six weeks abstinence no doubt it will. If the action of water is constantly applied, this disappears. Now we do not want to know the resistance of the skin, but of the tissues. We know that dry skin will run up to any resistance, and so will good insulators; but you do not want to know the resistance of a telegraph line when it is beautiful dry weather, when there is an east wind, no spiders about, nothing to cause contact, no boys flying kites, nothing going wrong—it is the minimum resistance you want to know; and here I believe the physiological point involved is not the maximum, but the absolute minimum. Now when you take the resistance of the body, after getting rid of this imperfect contact, it comes down to very much less than what has been generally given. The 500 ohms which I quoted from this paper would not have been put in a year ago; it is a stolen arrow out of my quiver, because before that I never saw 500 ohms given as the resistance of the human body; but that it can under certain circumstances, especially those of raised temperature, sink to 500, I have not the smallest doubt, because I can give actual demonstration of the fact.

But there is another point that comes out. The resistance of the human body is not equal, or anything like similar and equal, to high tension and low tension currents. If this be true, and it is one of the points I hope to go some little way towards proving, all our physiological work as to currents as physiological stimulants will have

to be revised in the view of this constant being altered. What is the power of these various induction machines? We know only very vaguely; it has never been measured or allowed for. The induction machines of constant current vary in their effects, not only on account of the physiological differences in the body or electrical differences in the current, but because not so much gets through in the one case as in the other. Take any case I have here in my notes. The resistance of a particular patient, suffering from diabetes, using 6 cells of my bichromate battery of about 1·8 volts each, was from foot to foot 1,210 ohms, from right hand to foot 1,350 ohms, and from left hand to foot exactly the same number. To the induction current from this little coil which I have here, which I have measured and know perfectly the electromotive force, it was, as against 1,210, only 473 ohms. That cannot be an instrumental error. Then from the right hand to the foot, as against 1,350, it was 735. I made it 750, but I was not quite accustomed to the telephone in those days as a means of measuring two currents on a Wheatstone bridge, and I think that was an instrumental error, only amounting, however, to 15 ohms. I have since taken the resistance of a gentleman, an excellent clinical clerk of mine, a very praiseworthy student of St Thomas's Hospital, and besides these merits he is 6 feet 3 inches high, and weighs 13 stone. From foot to foot his resistance was on the mean of many experiments 930 ohms. From foot to hand, which in his case, taking the external prominence of the ulna and the external malleolus, measures exactly 7 feet, so that I had 7 feet of human conductor, the resistance in a healthy and athletic condition was only 1,027 ohms, many times over. With alternating currents from foot to foot, as against 930 for a mean of 3 consonant observations, it was 650; from foot to hand, against 1,027, I had the mean of 3 observations, none of which differ much, 820. I think that cannot be an instrumental error. I found a trace of this difference in another case where electro-motive force, with an ordinary

battery, was gradually raised, and the same action took place, but in a much less marked degree. It was a case of dysentery, complicated by what is called tetany, for which I gave the electricity. The man is perfectly well now, and I meet him every morning; for these experiments are not dangerous, if anything they are salutary. These are his measurements. With two little bichromate cells, 2,500, 2,600, and 2,600 ohms. With 4 cells, that is twice the electro-motive force, 2,100, 2,000, and 2,000, three observations being taken at 10 minutes interval. With 6 cells, 1,800 and 1,720. With 10 cells, 1,590, 1,450, and 1,440—this was with an ordinary battery, making an alternative current merely by means of the hand. There was always a rise or fall from polarisation, which immediately takes place in the body; but still allowing for there being a constant error in each case, the steady fall of resistance to electro-motive force with these different powers of the battery quite agrees with the enormous fall which takes place when an induction coil is used. In the induction, which is an alternating current, we have the advantage of stopping polarisation, but in doing so a great part of the resistance has disappeared. The body is infinitely more easily traversed, and it is to be feared physiologically that we have lost a great deal of the delicacy of the test. It seems propable that very low tension currents will detect disease earlier than these high speed express electric currents which fly through anything, diseased and healthy tissue alike. Therefore the older method may physiologically prove the more valuable, though here I wish to speak at present with some reserve.

Another point may be named here. I can show that the resistance of the body is much altered in disease, and that it also alters with the metallic impregnation which takes place in certain trades. I have substantiated this with regard to copper, in a copper worker, and found a difference of nearly 300 ohms between the hand with which he held the hammer, which was impregnated with

copper, and the other side. I afterwards extracted from his secretion 3 milligrammes of metallic copper. With mercury the resistance goes down very distinctly, and with lead to a less extent, and I am now investigating silver. Silver I can obtain electrolytically from the body; as to its exact diminuation of resistance I wish to speak with reserve.

Then comes the question, How shall we measure this resistance of the human body? and here I must refer to one or two papers which have appeared in *Nature*. When first beginning, I tried a rotating, and then a metronomic commutator. The most delicate plan, however, especially to a person habituated to play on keyed musical instruments, was to use two commutating keys for the first and second fingers to manipulate, making alternate contact in one or other direction through the body; it was only an instantaneous contact, and, by carefully watching the galvanometer, tolerably trustworthy readings were obtained. They agreed from week to week, from day to day, and from hour to hour. This was better than using any metronomic commutator, because there is a kind of knack when you are used to a galvanometer: you know what it is going to do, and are ready for it. Here is a book full of measurements which agree fairly well, and some of which have been published; they range generally about 1000 ohms. A strong muscular man, such as Mr. Shackel, one of my clinical clerks, gave 920; and Mr. Todd, equally active but of much smaller stature, gave 940. Apparently the physiological law holds that the muscular size of the limbs to a certain extent compensates for the length of lever, and the resistance of men of different sizes comes in health to very much the same thing. In disease it may differ as much as 300 ohms. I brought before the British Association, at Southport, six cases of *hemiplegia*, or paralysis of one side—three on the left and three on the right. Of course they were selected cases, and the resistance was in the diseased side measureably less than in the healthy, generally about 300 ohms. This, again, I submit,

cannot be a mere instrumental error. It must be traced, if it is traced, to physiological facts.

At the meeting at Southport, my friend Professor Oliver Lodge suggested to me, that instead of using a galvanometer and resistance coils, with an ordinary battery, I had better use an induction coil and a telephone. We all know how delicate the telephone is in cases of alternating currents; and shortly afterwards I saw this very pretty instrument of Professor Kohlrausch's named in the *Telegraphic Journal*, and at once sent for it. There, the induction coil is mounted on a short metre bridge; the bridge is only one quarter of a metre long, but the scale underneath the metre is divided so as to be read off directly. You have fixed resistances of 1, 10, 100, and 1000 ohms. Those of course practically become multipliers to the metre bridge.

I have been using this instrument; but although very good for the measurement of fluid resistance, there is no doubt it measures somewhat lower than the ordinary low-tension currents; and it has the disadvantage that, when the 1000 plug is drawn, so considerable a portion of the induction current passes into the patient that he generally jumps out of his bath and makes strong remarks. Therefore I have been obliged to limit myself to the 100-plug resistance, which sends a good proportion of the current through the senseless instrument, though it a little crowds my measurements. I therefore procured a very beautiful bridge, also designed by Professor Kohlrausch, three metres long, of which the metre wire is wound ten times round a barrel; the edge of the barrel is graduated to 100°, so you read by means of a rotating contact the wire coils, and then take off the fractional parts by a fiducial mark from the graduated edge. It was suggested by Mr. Glazebrook, at a meeting of the Physical Society, that the telephone was too delicate to be used with this instrument. It is so delicate that one single 100th of a rotation of the circumference of the barrel, which has to be multiplied by 10 for the length of the wire, on either side of the minimum

sound, is perfectly distinguishable with a little practice. It requires practice and a musical ear. I happen to have an unmusical house physician who cannot make the observations half so well as I. With this I have been executing a number of measurements, and the resistance proves to be entirely different for this instrument and for an ordinary battery; but if that be a difficulty regarded on the electric side, on the other hand it will prove an advantage on the physiological side, because we shall have a delicate new test of the muscular tissue in health and disease, according as it transmits one or the other of these currents. Such distinction is by no means new. It has long been suggested that there is what is called the reaction of degeneration, which has been spoken of by Erb and Westphal, two German physicians, and it has been pretty well accepted now as a medical fact; but it will have to be revised in the light of different conductivity.

The only thing which now remains, before speaking very briefly of what electricity will do, is how shall we obtain a standard of measurement? In this case we know the electro-motive force, but if the *Lancet* is right there is no mode at present of measuring alternating currents. There are many persons in this room who can state the contrary of that; and when I wanted to find the means of doing such an impossible thing, I went to the Cantor lectures of our chairman. There I found a very simple formula which does it in an instant, and which is a formula that has been used by Dr. Hopkinson. Still lower is the ordinary formula for the electrometer charged to a considerable potential.

$$c = \frac{V_1 - V_2}{r_1}$$

$$d = k\,(V_1 - V_2)\left(V - \frac{V_1 + V_2}{2}\right).$$

There is another method which is more practical for ordinary purposes, namely, the dynamometer. Two years and one month ago I brought this little instrument, made by my own hands in my own little workshop, before the Physiological Society. It is a small dynamomete in

which the ordinary heavy coil, instead of being made of copper wire, is made of aluminium wire. That wire, I say distinctly, for a given mass, is far the best conductor existing of electricity, and if a light coil which shall move with a small movement is needed, one had far better use aluminium than any other metal. It was severely criticised by the Physiological Society at Oxford. In the first place, I was told by a member of the firm of Siemens that I could not get contact, and that the contact would be found to fail. This instrument has been knocking about my lecture-room and laboratory for twenty-five months; the contacts are made simply by twisting the wires together, and the variation of resistance is not one-tenth ohm. I was told that it had been tried for siphon recorders instead of a gold coil, but was not half so good. On that point I leave every one to his own opinion, but I adhere to mine that a light aluminium coil is better that a heavy coil, at any rate for my purpose. I purchased recently this very expensive dynamometer, also designed by Professor Kohlrausch of Wurtzberg. It is a beautiful instrument: a plate of platinum dipping into a vessel of sulphuric acid makes one contact, the other is a fine silver wire. In mine the contacts are made with a strong silver gilt wire used for making officers' epaulettes: it is hard wire and keeps it elasticity exceptionally well. No doubt the German instrument measures alternating currents, which the *Lancet* says cannot be done, but it is a long time about it; it is very sluggish. I have to put on a small contact key, then take the reading telescope (also a beautiful piece of mechanism) with metre scale underneath, only with the numbers inverted; it is read off with the telescope at a metre distance, and at about the end of four or five minutes it has gone up to its highest deflection. Of course with this current it goes up by little jerks, and by the time it has done so the battery has run down; and if anybody would tell me of a battery which would stand that treatment I should be deeply obliged to them. Therefore that sluggish heavy copper wire, weighing an ounce or two, will not do.

This one, with the despised aluminium, gets up to its full deflection instantly, simply because it has so little moment of inertia, and long before the battery has time to run down I have my readings; and the reading of this scale at one metre's distance with this telescope, with the small induction coil attached to the metre bridge, was on the scale the exact number of the days in a year, viz., 365 millimetres, a deflection abundant for any purposes. Here I had a reading in dynamometer measurement of the electro-motive force between two terminals of this particular coil. This had to be compared with a quadrant electrometer; but, unfortunately, I had not got a quadrant electrometer, nor did I know where to get one. After spending £50 on these instruments you see here, I wrote, hoping the Royal Society would assist me, but I twice received a formal refusal on a printed form. The question was, how was I to get hold of a quadrant electrometer, of which the constants were determined, and by which a poor working physician and physiologist could make a single determination without buying an expensive electrometer, which would cost six months' work to get in order? I think that if such a Society as this were to interfere in favour of us poor physiologists, and let us have the use of some standard instruments, it would fill up a very decided gap. It is not as if it were wanted on every day of the week, but only three or four times, just to get our constants. I accordingly appealed to my good friends at Cooper's Hill, Professor McLeod, Professor Stocker, and Mr. Gregory. They stood by me magnificently, and these measurements were made last week. At last we got the right determination, which comes as nearly as possible to the electro-motive force when the whole secondary current is allowed to enter the electrometer—about 401 volts. When it is divided on the bridge, if it is equally divided half goes through the patient and half through the fixed coil, so that we are dealing with a total electro-motive force of 40 volts, which gives a deflection on this dynamometer of 365. The deflection in this electrometer was about 1,070.

Though feeling that I ought to finish, I am tempted to say one word about the therapeutic value of electricity. Here we are in a very initiatory stage. I have shown that up to the present our very measurements are not made, and we do not yet know the tools we are dealing with. This Society of Physicists will, I am sure, enforce what I say. Before you begin to work with any tool you ought to know its weight, size, and efficiency, and this we were entirely ignorant of up to now. Then what can we do? There is no doubt that electricity, although it is not life, is very much akin to the principle by which impulses are transmitted in the human body, and therefore its effect both on muscles and nerves is very decided. Hitherto, as regards the curing of any diseases, I fear, more because of our ignorance how to use it than of its want of intrinsic power, we have not achieved any great result. We can do something where muscle is wasted; in cases allied to palsy in its various forms, where the palsy is more or less due to nervous disease, we can get the muscles exercised. I am in the habit of telling my hospital patients that I can give them a two miles' walk while they stay in bed. By attaching an intermittent current to the foot they will have the effect of a two miles' walk without moving out of bed, and the muscles will plump up and get firm and strong; and if the nervous disease which has caused the affection is only temporary, and is going to fade away, the muscles will not be left in an incompetent state with respect to the renewed nervous stimulus. It is also useful in various nervous diseases. I have known many painful neuralgias yield to a few properly applied currents. In certain diseases of the spine, such as locomotor ataxy and progressive muscular atrophy, you can do a great deal in a curative way.

The eliminative use of electric currents has not been utilised as it should be. I have thus extracted copper, mercury, and silver from the body; and lead has long been got out of the system by this means. The electrical current is a mode of loosening these metals in the system,

and then eliminants of a chemical type can be used. For copper I have used sulphate of ammonia, and the excreted copper increased immediately. In the case of copper the ammonia answered perfectly. In the case of mercury, iodate of potash has long been known to be efficacious. In the case of silver, I have been using hypo-sulphite of soda. I got the platinum plates well coated with silver and an abundant secretion of hypo-sulphite of soda. I find that agrees perfectly well with the patient.

Beyond this, it is proved also that there is an action of electricity upon that mysterious disease, diabetes. This curious physiological fact I brought before the British Association three years ago. There can be no doubt that the quantity of sugar and the quantity of excretion diminishes exceedingly if you pass a current across what is called the dialectic track of the brain, namely, floor of the fourth ventricle; unfortunately the influence is transient. Diabetes is an obstinate and persistent disease; and though I am almost certain to be able to produce a result, it evanesces after a week or two. Of course, if I could find any way in that period of pause or rest of lessening the cause—of which we are very ignorant now—of the increased excretion of the abnormal element, sugar, this might come in as an element in a rational and successful cure; but at present, as my old colleague Dr. Ord suggests, the effect is probably on the vaso-motor nerves, due to a power of contracting the calibre of the vessels by the action on the vaso-motor nerves. There can be no doubt that the floor of the fourth ventricle is in some way connected with this morbid excretion of sugar; of the intermediate stages we know very little. A fact has come to my knowledge a few days since, which very strongly confirms the idea that there may be some vaso-motor action when a current is passed through the base of the brain. It comes to me from another distinguished member of this Society, Colonel Bolton. He tells me he finds a moderate continuous current passed through the head from the back of the neck to one of the hands,

when you are sleepless from overwork or any other cause at night, will act as an efficient hypnotic. If that is a fact, and it was given to me entirely spontaneously without any leading up to, purely and simply as an observed fact, we have got hold of something very valuable. It agrees extremely well with the effects known in the case of hypnotics like chloral. We all know that the condition of the brain during sleep is anæmic, the supply of blood is lessened, function becomes to a certain extent diminished, and the body falls off into the condition of repose which is the twin sister of death. No doubt here are joined together the two terminals of what I begin with. This is the explanation then. The vaso-motor action—the contraction of the arteries at the base of the brain—is the cause of many fatal accidents; but if we can also say that it is the cause of the beneficient action of refreshing sleep, we shall to a certain extent redeem the character of the agent, and show that it does some good to compensate for its occasional evil results.

DISCUSSION.

The CHAIRMAN said they had had a most interesting lecture from Dr. Stone, who had thrown out some practical points which would not be accepted without question in some cases, and on other points he had directly applied to electricians to throw out ideas or give him information. For instance, he had asked them to tell him of a kind of battery which he could use for certain purposes, and also what kind of instrument would be best for the special investigations he had in hand.

Mr. LATIMER CLARK said he was in communication with the officers of the Russian sloop "Livadia," on which the accident occurred, and he would endeavour to get some detailed information on the subject, and communicate it to Dr Stone. The subject of the application of electricity to medicine has appeared in all ages an important one, and

no doubt many had wondered why so little practical success had hitherto been achieved. He felt that now perhaps for the first time they were in the right channel, for Dr. Stone was dealing with the subject in a thoroughly scientific manner and spirit, and if anything could be done to apply medical electricity to the benefit of mankind, Dr. Stone was likely to achieve it. Amongst other things Dr. Stone had spoken of popular errors, and he was glad to hear he had touched upon one that was very common. There seemed to be a sort of vague idea that currents of high tension were painful and dangerous on account of their high potential, but that was a popular error which should be exploded. He believed the human frame was precisely like a galvanometer—that the physiological influence of an electric current was solely proportionate to the quantity of electricity which actually passed through the body, and not at all to its tension. Of course high tension caused more electricity to pass through the body, and Dr. Stone produced the same result by giving better conductors to the hands and feet, but he conceived they should regard the human frame as a galvanometer, and that the physiological effects were proportionate to the quantity passing, and not to the potential current which passed.

Dr. KILNER: There is one point in Dr. Stone's valuable paper to which I must take exception, and that is the method he has been describing for obtaining the resistance of the human body. He has measured the resistance either from hand to hand or from foot to foot, or from hand to foot, thus including a large portion of the body, without any attempt to localise the resistance of the different parts. Although he has found the resistances taken in this manner vary from time to time (and supposing, for an example, the resistance is measured from hand to foot), he is unable to say whether the change is due to an alteration of resistance that has occurred throughout, or only in the arm, or in the trunk, or in the leg.

For the last two or three years I have been in the habit of measuring the resistance of the human body, only in a

different manner, aiming at obtaining the local resistance rather than that offered by a large extent of the body, because by so doing a more useful knowledge is obtained, as the resistance of a diseased limb not only very frequently differs from what it would be in health, but that under certain circumstances the local alteration of the resistance has enabled me to give a more certain prognosis than I could have done without. The method I employ was fully described last year in the *Lancet*, and is, leaving out the details, as follows:—I place the two electrodes at a convenient distance apart, and measure the current by means of a vertical mirror galvanometer as quickly as possible, and then place the electrodes at exactly half the distance apart, and again measure the current, using the same battery. From this, if the area of the electrodes be known, not only can the resistance of the epidermis, but also that offered by the subjacent tissues between the two electrodes, be calculated. Another advantage accrues from this method, viz., that as the resistance is altered after the passage of the current from what it was previously, the state of contraction of the local blood-vessels can be determined, because the current dilates them, and as the blood is the best conductor of all the animal tissues, the resistance will decrease in direct proportion to the increase of the amount of blood to the part.

This leads us to another point just touched upon by Dr. Stone, namely, the effect of the current upon the circulation. I have this day finished a paper upon the subject, and may state that there is a great difference between the constant current and one obtained from an induction coil, inasmuch as the latter exerts its power chiefly upon the general circulation by lowering the arterial tension, no matter where the electrodes may be placed, while the former is almost entirely local in its action.

Mr. WALKER: In discussing the effect produced by the electric current upon the human body, we, as electrical engineers, are, it appears to me, in the same position that

the large majority of the medical profession are with respect to electricity.

Our knowledge of the complex structure of the human body must necessarily be extremely superficial.

We can, however, I believe, by careful use of what little we do know on the subject, indicate in a great measure what it appears to us should take place within the body when a current of electricity passes through it.

To commence, it appears to me that, though Dr. Stone has spent a good deal of money, and much time and labour, in measuring the resistance of the human body generally and of his tall clinical clerk in particular, it is by no means of so much importance to know the total resistance of the body as the proportion between the resistance of the different parts, the different organs, etc. It appears to me that no result approaching perfection will be obtained until those applying electricity to the human or any other animal body, are in a position to map out the several branch electric circuits which are formed by the different substances to be found in any portion of the body through which a current may be passed just as an electric light or telephone engineer would plan out his circuits of wires lamps, etc., and observe the effect of the different branches one on the other. To my mind, provided the relative conductivity of each substance be established, since the dimensions, form, etc., of each vessel, ligament, etc., should be well known, the planning of the animal circuits, if I may use the term, should present no very great difficulties.

Now, as to the effect of the electric current upon the body: I think we must have at least three results, we shall have first electrolysis of the blood and other fluids, and as a result of the electrolysis, we shall have a development of oxygen at the anode or entering pole, and of hydrogen at the cathode. I invite Dr Stone's attention to this point, and as to what will be the effect of the generation of these gases at different points.

It is also worthy of consideration whether these gases are *developed* only on the surface of the body, or whether,

owing to its peculiar conformation, minor electrodes may not be set up internally, where the gases may be set free in smaller quantities, and what would be the effect on different organs, by the development of such gases in their midst. We must, also, I believe, have heat developed, since the current meets with resistance in its passage, and it also appears to me that this generation of heat may possibly be the explanation of the deaths that have occurred, which are not traceable to simple shock or stoppage of the heart's action.

I think Dr. Stone is wrong in separating the effects due to lightning from those due to high tension electric light currents. To my mind they appear to be one and the same, except that lightning has of course a very much higher tension than any electric light current we have dared to use at present.

I submit it for the consideration of the medical profession, whether a vital organ might not be fatally injured by the passage of an excessive current through it and the consequent generation of heat in it.

Dr. Stone has been puzzled by the fact that in the case recorded of a musician being killed at Birmingham through incautiously taking hold of naked wires in which electric currents were passing, the man was not killed instantaneously, but lived three quarters of an hour. I suggest for Dr. Stone's consideration whether the lung or one of the great vessels may not have been so seriously injured that, though the man did not die immediately, the action of life could not go on long. In the cases that have come under my notice, where men have incautiously taken hold of wires in which high tension currents have been passing the action appears to have been twofold:—

First. The shock to the nerves supplying the hands, have caused the latter to contract, closing the hands upon the wires, so that the man was unable to let go. Then his body forms a derived circuit, with the wires and apparatus used in furnishing electric lights; the current passing principally by the path of least resistance through the

arms to the lungs and the heart, all of which are in direct electrical connection with the hands, by means of the venous and arterial system. Providing, therefore, that the tension between the points at which the man has taken hold of the wires be sufficiently high, the other resistances of the circuit being also high, as they would usually be, a powerful current whose heating effects must be dangerous, at once pours through his most vital parts, and it appears to me must simply burn them so seriously that they can no longer perform their vital functions, if it continues long enough. If we consider the electro motive force used in those systems that have the credit of having slain most victims, and compare them with the resistance of the human body, and a current a person can stand without pain, we shall, I think, no longer be surprised at the serious results reported.

Taking the E. M. F. of the 40 Light Brush Machine at 2000 Volts, and the resistance of the human body at 1500 ohms, which would be a high figure according to Dr. Stone's measure, we should have a possible current of at least $1\frac{1}{3}$ ampères, or, if the extreme case be taken of 500 ohms as the resistance of the body, a current of 4 ampères might be passing through it. Now, remembering that the current usually applied in surgical operations only amounts to a few milliampères, say, 5 at the extreme, that being, I believe, as much as either a very strong man, or a man whose nerves were dead to the effects of the current could stand; and that there is no reason why the formula $H = C^2 R$ should not hold good in this as in other cases, we should have, under the circumstances I have supposed, as those which apparently actually do take place, a heating effect at least 40,000 times as great as a man can stand under ordinary conditions without pain.

In addition to this, in the case of the Brush or any other system of Arc Lighting, where large variations in the strength of the current occur, he would be subject to the very much higher E. M. F. due to the extreme currents that would be formed. In reality, therefore, there appears

to be very little mystery about the matter. Given a circuit so arranged that a man can command between his two hands, or between his hands and any other part of his body that may be, or can get into contact, either with another part of the circuit, or with the earth where the insulation is not perfect, it is only necessary that the E. M. F. available from whatever cause shall be above a certain figure for disastrous results to ensue, and I think we may fairly ask the medical profession, or at least, those of them who are making a study of electricity, to inform us what E. M. F. we can safely go to.

Now, as to the resistance of the human body, Dr. Stone has given us the result of a number of measurements which he has taken of this, as he appears to consider, important factor. The principal result that he appears to have obtained is that he can really obtain no satisfactory measurement, such that we may call the resistance of the body empirically, so many ohms, and have done with it. The great feature about the measurements appears to be, that they all differ.

Some two years since, we were told that the figure was 6000 ohms; now it appears that the long clinical clerk whom one would think would measure more in this way, than smaller individuals, only measures a little over 1000 ohms, for 7 feet of him; and that he cannot even be depended on for that, as, when measured with an alternating current, he immediately drops to 930 ohms, and Dr. Stone tells us, it may even be as low as 500 ohms.

Dr. Stone has himself pointed out one cause of the apparent discrepancy, viz., imperfect contact.

Every electrical engineer knows, to his cost, that the value in ohms of a bad contact may be considerable, but I think we should know from Dr. Stone in what sense he uses the term. Does he mean greater or less resistance between a conductor of a definite size, and the portion of the flesh against which it is applied? We know from Dr. Stone, Dr. Althaus and others, that this will vary very largely in different parts of the body, and in the same part

under different conditions. A man with wet hands, for instance, trimming a Brush lamp in the open on a wet night, may be trusted to make very good contact with an electric light wire if he takes hold of it. On the other hand, the hard, dry, and possibly dirty hand of a labourer would probably make a contact whose resistance would be very much higher. It is evident that the variations in the resistance offered here is very great. But there is another sense in which the contact may vary very much, and that is, in the size of the electrodes applied to the body.

Other things being the same, it is evident that the resistance offered by the body, or a portion of the body, will be much less when taken between large electrodes than between small ones. In the case of the galvanic bath, for instance, where the metal of the bath and the liquid, with the patient immersed, perhaps, all but his hands, is in connection with one pole of the battery, while the other pole is connected to a rod or chain which he holds in his hands, I think it must be clear that the resistance offered in this case must be small, and this view is borne out by the low E.M.F. of the batteries that are used with galvanic baths.

Take a possible case also, of a man placed between two flexible sheets of conducting material, one fitting his body closely everywhere in front of the body, and the other at his back, so that the cross section embraced between the two, was a measure of the average depth of his body, would not his resistance in this case be very small indeed, taking Dr. Stone's measurements as our base? I venture to suggest also, that what appears to be resistance, is not really so; but as in other cases, well known to electrical engineers, we have opposing E.M.F.'s, reducing the effective current, and therefore being measured as resistance. If we examine the structure of the human, or any animal body, we find, I believe, in every part, a vein and an artery running side by side. Taking into consideration the smallness of the currents with which we are dealing, we may regard these as conductors, relatively to the other tissues, &c

Since, however, currents are passing in the vein and artery, each will create a magnetic field around it, very minute it is true; but then so is everything we are dealing with in this matter, so far as electricity is concerned.

But, further, since the flood in each vessel is in motion and that somewhat rapid motion and in opposite directions, each becomes, when a current is passing through the portion of the body it supplies, a conductor moving in a magnetic field; and in each, therefore, we may expect to find an opposing E. M. F. set up.

I suggest for Dr. Stone's consideration, that this opposing E. M. F. which is set up, owing to the creation of a magnetic field by the current, is the probable explanation of the marked difference between the resistance of identical bodies, or portions of bodies, when measured with a continuous current, from that given when measured by alternating currents.

The latter, creating a more feeble magnetic field, which, moreover, would be constantly changing its polarity, would not give rise to, at any rate, so great an opposing E. M. F.

If this is so, then the resistance measured by alternating currents would be more nearly the true resistance than that measured by the continuous current.

I am afraid, however, that even this does not bring us to the bottom of the matter, and that nothing but a map of the body, as I have before remarked, and a very careful study of that map, will bring us anywhere near a satisfactory solution of the problem.

We have to remember that each pulsation of the alternating current will give rise to secondary currents in every part and every tissue in the neighbourhood in which a current can pass; so that the final result must be exceedingly complicated.

Further, Dr. Stone remarks that he finds a difference in the resistance, measured with every change in the E. M. F., of the testing battery. I believe, from observations of my own, that he would find the same variation

if the resistance was measured, after the current had been passing through the body for some time.

I think that we can hardly accept the fact that the electrical resistance really does change, unless some physical change has previously taken place. We know of no other case in which a body varies its resistance, without a physical change having occurred; and we know of no reason, at present, why the body should differ in this respect from other substances.

I suggest that the change is due to the action of the current developing heat in the tissues, electrolysing the liquids contained in the tissues; and possibly that a third property, which I have not yet mentioned, viz., electrical endosmose, may also, by altering the position of the liquids relatively to the tissues, affect the same result.

This property of the current last mentioned I would also strongly recommend to the notice of the medical profession. I believe I am right in stating that many of the most important functions of the human body, many of the secretions, and a large portion of the process by which the different organs receive their nutriment from the blood, is effected by the enudation of these liquids through delicate membranes; and it appears to me that the mere passage of an electric current must materially assist this action, provided it pass in the right direction.

It is, again, an important matter for consideration, what effect an excess of current might have upon some of the delicate membranes which perform these functions, and how far electrolysis affects the process.

There is one other action which the electric current performs in passing through the body, and that is to excite the nerves. Apparently, also, it has the property of restoring the lost vitality to a nerve. Dr. Althaus, in a pamphlet of which I have a copy, gives some very remarkable instances of the restoration of overworked brains to their pristine vigour, by the application of a current of electricity through it.

It certainly appears to me that this also is a matter that is well worthy the careful study of the medical profession. I would suggest, that what takes place here is an actual conversion of energy, from the form of an electric current to the form, whatever it may be, that apparently resides in the brain, and controls the actions of the body.

I fear that my remarks have extended to a great length. I must, however, plead as my excuse, the great interest I have taken in this branch of the subject for many years.

Mr. BEEMAN said the accident at Hatfield took place nearly half a mile away from the machine, and though no doubt the coroner's jury brought it in that the man died from electric shock, he believed that if Dr. Stone communicated with the medical officer it would be found that the man was suffering from heart disease, and was six yards away from the wire which was supposed to have killed him. There was not the slightest mark on his body to indicate that he had touched the wires at all.

Mr. GREENHILL said if a man were suffering from disease of the heart and got a sudden shock it was very probable he would die, and his death would be so recorded, usually speaking; but if he happened to be near a dynamo-machine, the papers would record that he was killed by a shock of electricity.

Dr. STONE said he had a newspaper report which bore out very much Mr. Greenhill's remarks, for, though attributed to electricity, it was an obvious case of heart disease.

The CHAIRMAN, in proposing a vote of thanks to Dr. Stone, said he must make one remark with regard to the accuracy of one of the instruments referred to. He was not sure that electricians would be quite satisfied with the accuracy of what was put forward by Dr. Stone, viz., that resistance could be measured to within $\frac{1}{10}$ of an ohm by the instrument in which the aluminium wire was used. Nowadays electricians would not be satisfied with anything

which did not give the resistance in ohms carried to several places of decimals.

Dr. STONE, in reply, said he should be very much obliged to Mr. Latimer Clark if he would kindly get him the information in regard to the accident. It seemed to him that rapid fluctuations of current created the danger, not the actual quantity of current, and even then the action was more marked on the unstriped or involuntary muscles than on the voluntary muscle fibre. Most of his experiments had been conducted conjointly with Dr. Kilner, who had worked with him now for several years, and therefore his experience naturally coincided. As regards Mr. Walker, he agreed with some things he said, but did not quite agree in others. It was quite impossible to attempt to distinguish between the tissues of the body when a current was passing through them all. It passed through them indifferently, and you could not separate it, or say that the blood, the muscle, or the nerve conducted so much. As far as they knew, the nerve, to ordinary electricity, instead of being what it should be, a good conductor, was a remarkably bad one; muscle was much better; and water, simple serous fluid, or saline solutions were better than all of them. He thought that the body followed the law, as regards heat, more of solid than fluid conductors: where dropsy took place resistance went down to half, the dropsical fluid being a much better conductor than healthy muscle, bone, or tendon. As to the movements of a conducting fluid, it did not move in a magnetic field; and nobody but the author of the pamphlet he had quoted suggested that there was in the interior of the body a magnetic field of any appreciable force. He certainly was not aware of it, or of the influence of magnets in his neighbourhood, nor had he ever been able to influence himself by the neighbourhood of magnets. He had tried the experiment on a large scale, and it was now being repeated by a society at his laboratory, but excepting the imagined sight of flames by some hysterical girls, nobody had been able to point to any effect produced by magnets

whatever. He had used a battery of fifty 3-quart cells and a large electro-magnet, and had lain down on the pillow with his head between the poles of this enormous magnet, but though it was competent to rotate a ray of light through a number of degrees, it could not rotate him through one.

EPIDEMIC DISEASES.

CONFERENCES BY THE EPIDEMIOLOGICAL SOCIETY OF LONDON ON TUESDAY and WEDNESDAY, JULY 22 and 23.

HEALTH IN INDIA.
CHANGE IN TYPE OF EPIDEMIC DISEASE.
LEPROSY IN INDIA, AND THE BEST MEANS OF PREVENTING ITS INCREASE.
TYPHUS FEVER DURING THE PRESENT CENTURY.
THE ASPECTS OF CHOLERA IN EUROPE AND ELSEWHERE.

THE EPIDEMIOLOGICAL SOCIETY OF LONDON.

CONFERENCE ON TUESDAY, JULY 22, 1884.

NORMAN CHEVERS, Esq., C.I.E., M.D., in the Chair.

SUBJECTS FOR DISCUSSION:—

1. "*Health in India*" By NORMAN CHEVERS, C.I.E., M.D., F.R.C.S., Eng., President of the Society.
2. "*On Change in Type of Epidemic Disease.*" By WILLIAM SQUIRE, M.D., F.R.C.P.

THE PRESIDENT'S ADDRESS.

GENTLEMEN—It is scarcely needful that I should tell such an audience as this what are the objects of the Epidemiological Society of London, or explain our motive in assembling here to-day; but, as many strangers have honoured us with their presence, I may be allowed to say that the chief object of our Society's existence is to watch such pestilences as that which now occupies a considerable part of Europe, and which threatens the United Kingdom; to study their mysterious ways, movements and changes, which are often quite inscrutable even to the most experienced and learned; to become acquainted with their natural history; to track them, step by step, as the hunter tracks the tiger and the wolf in all their concealments

and devious lurkings, and thus to anticipate their attacks and to discover means for their avoidance; or, at the worst, to adopt measures for the relief of those who are their victims.

As, therefore, it is now part of the great and wise benevolence of the honoured son of our beloved Queen to organise, in this place, a display for the instruction of all men, of the various means which Almighty Providence has vouchsafed to grant to afflicted perishing creatures in their contest against disease and death, it certainly does appear fitting that we of the Epidemiological Society should now meet you here and enter upon a discussion of certain of the great subjects to the study of which our lives are devoted. Thus, if you will bear with us, we will discuss with you such vitally important questions as these—the changes which, even within our own memory, have taken place in the type or character of those terrible maladies which most fatally assail us. Thus, fifty years ago, typhus fever was one of the most common and direst pests of London; yet, for many years past, it has been a malady of very rare occurrence here, the true enteric fever of Jenner having taken its place. Why is this? Listen to what a very eminent authority will tell you to-day:—

From the time of the Crusades, up to the reign of King James I., leprosy ravaged these islands, which contained many refuges for lepers. Now, this dire malady is more rife throughout Hindustan than it was in Great Britain. An Indian officer of great ability and experience is prepared to lay before you means by which this loathsome evil may be lightened in India.

Still, again, although that India is far from you, I am anxious to cultivate the interest which I am certain you all feel in the sufferings from pestilence and famine of its still uncounted millions, and an attempt will be made to show you what a vast and terrible amount of avoidable death prevails there, and to engage your attention and co-operation in the great and saving work of reducing that excess of mortality by sanitary measures.

Of still greater and nearer interest to us all will be a review, by a master of the subject, of that malady—which some vainly designate as "sporadic" cholera, but which all who really know the disease, having done life-long work among its sick, recognise as *true, malignant epidemic cholera*, which now occupies a considerable part of France. Such a review—while it will tend rather to quell than to excite vague apprehension, promises to acquaint us with our true position; and, should it be the will of Providence to visit us, to arm us validly with those weapons which have been, in infinite mercy, vouchsafed to us for our defence.

It has been advertised in this morning's papers that our Society is to hold a congress on "Tropical Sanitation." It appears needful that I should explain that, although two of our subjects bear upon sanitation in India, the three others, forming the most important portion of the work of this Congress, are absolutely unconnected with "Tropical Sanitation," and have reference solely to questions of home interest.

HEALTH IN INDIA.

By NORMAN CHEVERS, C.I.E., M.D., F.R.C.S., Eng.,
President of the Society.

BOMBAY, a city delightfully situated upon an open bay, considered to be scarcely inferior in beauty to the Bay of Naples, was made over to us by the King of Portugal in 1661, as part of the dowry of Catherine of Braganza. When Dr. John Fryer visited Bombay, about eleven years later, he found the English President living with all the state of a Viceroy, having a council, a body-guard of cavalry, chaplains, linguist, mint-master, physician, chirurgeons, and domestics, silver staves to wait on him whenever he moved out of his chamber, trumpets to usher in his courses, soft music at his table, large milk-white oxen for his coach, standards borne before him, and a sombrero of

state always carried over him ; still "for all this gallantry," adds Fryer, "I reckon they walk but in charnel houses." "In five hundred, one hundred survive not ; of this one hundred one-quarter get not estates ; of those that do, it has not been recorded above one in ten years has seen his country."

During the 212 years which have elapsed since Fryer visited India, the British rulers of that country have lived quite as well as they did in his time, possibly, too well ; but, notwithstanding the spread of enlightenment, the improvement of medical science, and the introduction of large measures of sanitation, the Anglo-Indians of the present day have not wholly succeeded in throwing off their ancient habit of "walking in charnel-houses."

To those who have not fully considered the matter this may appear strange when I mention that, while the worst diseases of India—cholera, marsh fevers, and dysentery—are in a large measure avoidable by those who live prudently and comfortably, he who takes with him to that country a sound constitution, as most Europeans do, may anticipate complete immunity from many of the direst maladies of his native land, such as pulmonary consumption, cancer, rheumatic fever and heart-disease, scarlatina and typhus, gout and scrofula.

It is not easy to review, in a space of less than half-an-hour, the diseases which annually destroy about 5,000,000, in a population of 260,000,000, and to point out the means by which, under Providence, that vast mortality may be commanded and diminished. It is clear that none but large facts must engage our attention. I think that the consideration of these facts may afford some useful suggestions to our home sanitarians.

Practically, much good sanitary work was done in India, especially in ships, military cantonments, and prisons, long previous to the year 1858, but it was only after the promulgation in that year of the report of Sidney Lord Herbert of Lea's Commission on the "Regulations affecting the Sanitary condition of the Army, the Organisation of Military Hospitals, and the Treatment of the Sick and

Wounded," that Government began to establish a sanitary system in India. The history of the introduction of that life-giving measure among our Oriental millions will afford a singular illustration of the forces which retard human progress, which has still to be placed on record. It is sufficient to say here that India did not receive the boon with any tokens of hearty appreciation or cordial gratitude.

Much has still to be done before the General Census, Birth and Mortality Returns of India can be regarded as being either full or accurate; still, as we now have them, they convey to us many importantly suggestive truths.

The census of 1881 showed that India then had a population of 253,891,821.

Fayrer gives the registered deaths from all causes in India, in the year 1879, as 4,975,042.

Among the principal causes of sickness and mortality in India are famine, those malarious fevers of which ague is a type, cholera, bowel complaints, and small-pox.

I shall review these and the means necessary for their prevention with great conciseness.

Famine.—We need only open the table of contents of Hunter's 'Annals of Rural Bengal,' to learn what dire consequences arose in that province during a season of scarcity. We have these headings—" Permanent effects of the Great Famine of 1769–70. The crop of 1769. Distress anticipated, but the land-tax raised. The famine declares itself. One-third of the people perish. The living feed upon the dead. The December harvest (1770) restores plenty; but to a silent and deserted province."

The famine which ravaged Orissa in 1866, consequent upon the failure of the rice-crop of the preceding cold season, is supposed to have carried off at least a fourth part of the population of that great province. In the Pooree district alone, 213,944 deaths occurred in a population of 754,751.* Dr. Vandyke Carter calculates, from official returns, that, in the famine years, 1877 to 1879, the

* "Report on the Famine in Pooree," by Udoy Chund Dutt, Ind. An. Med. Sc., No. 23, p. 311.

population of the Bombay Presidency lost an excess upon the ordinary rate of 188,326 by fever alone; and that, in 1877, their total deaths were 627,708, or 259,448 (41·3 per cent.) in excess of those of the previous year.

With regard to the destructiveness of the great famine which prevailed in the Madras Presidency, chiefly in 1877, my friend, Dr. Lewis, has most kindly obtained for me the following data from the returns. In the six years 1874–80, the population of that Presidency, averaging 29,209,586, lost, from all causes per 10,000, at the registered rates of 211 and 233 in the first and second year, of 532 in the famine year, and of 278, 189, and 157 in the three following years.

Although declared famine does not constantly prevail as a cause of mortality in India, failure of crops in any year may produce it, and neither civil war nor pestilence works such lasting ill effects upon a population as it does. The means for its prevention must therefore be permanent and constantly available. Among the chief of these are irrigation works sufficiently extensive to obviate as far as possible the evil effects of dry seasons. Writing two years ago, Sir Joseph Fayrer showed* that there were then in India "12,750 miles of lesser or greater canals, whilst the total length of the distributing canals is unknown." In Northern India alone, however, it amounts to 8300 miles. The area now irrigated amounts to 1,900,000 acres in Madras and Bombay, 300,000 in Behar and Orissa, 1,450,000 in the North-West Provinces, 1,350,000 in the Punjab, and 1,250,000 in Scinde; in all, 6,310,000 acres. A great and noble work assuredly! Still, "what is this among so many?" The report exhibiting the moral and material progress and condition of India during the year 1881–82, shows that protective works, the first object of which is to forestall famine, are "constructed on a yearly allotment of £750,000, the moiety of the one and a half million set apart annually as a Famine Insurance Fund."

The extent of India is so great, and the productive

* "On the Climate and Fevers of India."

power of its acres is generally so large, that famine has never visited the whole peninsula. Consequently, whenever the superabundant produce of provinces A B and C can with sufficient promptitude be conveyed to and distributed throughout the famine-stricken districts of province D, the evil effects of a season of scarcity will be reduced to a minimum. Therefore, railways and good roads are among the most efficient means of preventing and relieving famine in India. Little more than thirty years ago I witnessed the opening of the first section of the railway line in India. Mr. Juland Danvers shows, in the report above cited, that, in 1881–82, the length of railways opened in India was, broad gauge, 6959 miles; narrow gauge, 2955. The grain-conveying power of these lines (which are shown in this map of India, and which are in process of daily growth) is very inadequately represented by the statement made in this document that "the Great Indian Peninsula Railway carried to Bombay in 1881 about 500,000 tons of wheat alone, against 146,600 in 1880;" and that "the wheat railed to Calcutta amounted to 137,700 tons in 1880, and 304,400 tons in 1881."

Besides this, it was arranged many years ago by the Government of India, in the Public Works Department, that whenever a first-class road should be undertaken, its construction should be such as to admit of its being readily adapted for railway traffic.

I have long believed and argued that a poor and insufficient staple of food afforded throughout vast Indian districts, as among the *dasee* rice-eaters of Lower Bengal and the *kesaree dal* feeders of the Central Provinces, is a cause of disease and life-long starvation to multitudes far larger than those who are swept down by periodic famine. For many years past the Government have perceived the necessity for developing the agricultural resources of India, of improving the staple of grain, and of conserving and extending the forest and tree-growth generally; by which latter means it is to be anticipated that the rainfall will be increased and equalised, reducing the torrid heat of the

climate, and fertilising the soil. In a Presidential Address, delivered at the annual meeting of the Bengal Social Science Association in 1870, I showed, by statistical evidence, that what Dr. Tytler designated *diarrhœa hectica* is so prevalent a cause of death among the poor of Bengal Proper (it also occurs largely in other parts of India) that I had distinguished it as *Morbus Bengalensis*. I then stated that, having watched this disease closely for more than twenty years, in an extensive field, I was perfectly convinced that it is a gradual failure of the powers of digestion and nutrition, not to be remedied towards the last by any mode of liberal feeding, the patients dying, physiologically, in a state of starvation, however well they may be fed. I urged my distinct conviction that this inability of the system to receive nourishment is mainly due to the slow failure of the nutritive faculty, under a life-long system of feeding upon poor, bad, and indigestible food. I believe that a state of famine which, although almost imperceptible to the ordinary observer, is, on this account, more widely, stealthily, and surely destructive, constantly prevails in Bengal. Born of a famine-stricken race, nursed by a starved mother, working hard upon a food the use of which is slow starvation, the Bengali's life burns out rapidly, as the feeble light does in his poor *chiragh* (oil-lamp), and for the same reason—want of fuel. I believe that I am not original when I say, that rice has ruined Bengal as the potato has ruined Ireland. Both countries are endowed by nature with soils of great fertility. In the Middle Ages, Ireland was celebrated for her herds of cattle, which she exported in abundance to England and other countries. Bengal was, at about the same time, a land of great pastures, upon the rich grass of which the sacred herds fed in such multitudes that they were offered by ten thousands in sacrifices to Kalí.

I then contended, and still believe, that the only valid remedy for the *Morbus Bengalensis*, as well as the only means of enabling the Bengali to withstand the marsh-poison of his country, until he shall have driven out the

malaria by bringing his rice swamps into dry cultivation, is the introduction into Bengal of a higher staple of food. I urged and still urge the necessity of mature deliberation and steady action upon the questions—(1) How far it may be possible to widen the pasturage of Bengal, and to extend the cultivation of wheat and legumes, of oil-producing plants, and of fruit trees, especially the mango, throughout the country; and (2) to what extent, in the meantime, the opening of ports along the sea-board, and the extension of railways through the most fertile tracts of India, may allow of the importation of wheat into Bengal until the country can produce its own wheat. The poor Bengali gladly eats wheat-meal when he can get it, which is very rarely indeed. Whenever I asked a patient what diet he would prefer, the reply was "Ek bala roti, ek bala bhat," one daily portion of wheat-meal chupattees and one of rice. Within the last few days I have been informed that the cultivation of wheat in Upper India promises to enable Hindostan to supply the wants of the United Kingdom. I do not find an indication of such promise in the latest statement of moral and material progress and condition of India; but I do not think that the contemplation of such a result is absolutely Utopian; and I trust that, should Providence vouchsafe to ordain it, the benefit will be extended to the underfed multitudes of Lower Bengal.

Fayrer has shown that the registered deaths from fevers in 1870, were 3,564,035 out of a population of 187,105,833. The very large majority of these fever deaths were due to marsh and jungle influence. Would any other nation have been as little active as we have been in reclaiming, with a view at once to enhance agricultural produce and to maintain public health, the waste and swamp lands of India? Although, as a Briton, I would hold them, as a sanitarian I should not be sorry to cede vast tracts in both India and the United Kingdom to those admirable land-reclaimers, the Dutch. I feel certain that, had they held rule for the last two centuries from Batavia to Cabul, India would have far less fever, and a great deal more wheat.

beeves, and sheep than she now possesses. As I have just said, the spread of wheat cultivation ought to tend in some measure to the mitigation of the evil of marsh-fever engendered in irrigated rice-fields. I cannot but look upon their want of action in reclaiming land which is the source of the most prevalent and the worst diseases of the country as the weakest point in the Indian sanitary system; but much improvement in this respect can hardly be anticipated as long as the men of the direly threatened city in which we now stand are willing to allow millions of acres of swamp-land to impest every breath of air which reaches them from their east and from their west. I believe that, when cholera next visits London, at least 90 per cent. of the mortality will be due to the fact that the Londoner is as insensible to the evil influence of his marshes (I speak as a Kentish man) as the animal that grazes there!

With regard to the Prevention of Small-pox, India has a well-organised and widely-spread system of vaccination. This succeeded a native system of small-pox inoculation, which was probably more widely spread, but of less preventive efficacy. When I first knew Bengal, 75 per cent. of the adult population had been inoculated, and therefore stood secure against small pox. The excellent report which I have so often cited shows that the total number of vaccinations in India during 1881 was 4,414,342 with a percentage of success to primary operation of from 80 to 98·23.

The Government statement shows that the numbers of patients treated in the Civil Medical Institutions, Hospitals, and Dispensaries of India were 7,397,095 in 1880, and 6,999,965 in 1881. In these years respectively, the numbers of in-patients were 216,298, and 218,376. In 1881 the cost of maintaining these institutions was £370,586. In that year, 8,288 surgical operations of great importance were performed, with 5,758 recoveries, and 283 deaths. Cataract cases were operated upon in 2801 persons, 1803 of whom were restored to good sight I have noted that, in the dispensary at Seharunpore, no less than 831 stone cases were

operated upon in the eighteen years ending July, 1866.* There is a point of minor, but still of vast importance, to which I would just allude, as it at present excites a good deal of attention in charitable circles. Not many years before I went to India in 1848, women in that country trusted to midwives in the hour of their greatest trial; even English ladies were attended by native *daees*, whose ignorance was not so much absolute as horrible. Now, and for many years past, in India, as in Europe, all European ladies are attended by medical men. Within my own time, in England, the midwife has been changed from a professional person into a nurse. Unquestionably, the ignorant and absolutely unteachable *daee* still prevails in millions of native households, and there is on foot a movement to send professionally educated women to India, with a view to the abatement of this evil. Undoubtedly, the intention is prompted by benevolence, but I perceive clearly that, unless it be conducted with great tact and care by highly-qualified and judicious ladies, the measure will prove retrogressive, and will result in more harm than good. I would enquire of those excellent ladies who are earnest in promoting this mission—would they and the majority of their country women advocate the introduction of this system at home? They possibly would, but no one else would entertain the idea for a moment—otherwise the project of educating medical women for home work would receive very much greater encouragement than it does at present. In every one of the many years of my Indian experience, the aid of English medical men in these cases was more and more sought for by the natives, and I believe that the number of those natives who would rather allow death to occur than call for the aid of a medical man, is yearly becoming more and more minute. Is it wise to check this advance in humane and saving enlightenment by sending out medical women, however highly-qualified they may be? I do not think that the oldest of the two lying-in-hospitals in the

* Dr A Garden

city of Madras has been established more than thirty years, and yet, in the year 1882, no fewer than 1904 confinements, chiefly native, took place in those admirably conducted institutions. Does true humanity demand that such progress should be discountenanced and checked in its present vigorous and most hopeful growth by this latest offspring of mistaken philanthropy?

In briefly considering the questions—What are the present death-rates in India? How do they compare with English rates? and how far does Indian sanitation appear capable of reducing mortality? I may as well say one or two words germane to my last observations. I have recently worked out the statistics of 808 married ladies, European and East Indian, who died from all causes, not merely in child-bed, between the ages of fourteen and fifty, in the time of midwife ascendency, up to 1848. Of these ladies fifty-one, or 6·3 per cent., died in child-bed.

Dr. McClintock † gives the death-rate of parturient women as one in the 100. In 1882, the death-rates of women in child-bed, in the two Madras lying-in hospitals (where many neglected and ill-managed native women were received in a dying state), were 2·94 and 3·13 per cent.

In 1858 I showed that from the commencement of the present century, the average annual rate of mortality in hospital, from all causes, among the men of H.M. and the H.E.I.C.'s European Forces, in the Three Presidencies of India, had been

62·45 in the thousand.

Surgeon-General Hugh Macpherson found that, during the eight years ending 1853-54, the hospital death-rate of European Troops in the Bengal Presidency was

63·38 in the thousand.

During these eight years the total number of deaths out of hospital was 1175—a large proportion, the occurrence of which was explained mainly by the fact that nearly the whole of this period was one of active and trying warfare.

* As cited by Dr. Playfair.

The returns show that, during the last five years, the mortality rates of our European army throughout India, have been :—

1878—21·46
*1879—24·28
*1880—24·85
1881—16·86
1882—12·07

In comparing these rates with those given as prevailing shortly before the Great Mutiny of 1857, it is to be borne in mind that the early rates belong to a period in which the health of the troops suffered greatly in war, and from all the destructive influences attendant upon field service in enemy's country. The hitherto unexampled lightness of the death-rate of 1882, viz., 12·07, is in a large measure attributable to "the remarkable abeyance of cholera among the European troops." We can hardly expect again to have so low a death-rate within the next decennium. Still this exceptionally small Indian death-rate of a single year —12·07 per mille—is seen to be comparatively large when we find it shown, in the Army Medical Department Report for the year 1881, that, during ten years 1871–80, the death-rate of the whole British Army, at home and abroad, only exceeded it by a fraction, being 12·59 per mille, while the rate in the West Indies was 11·02 ; in the United Kingdom 7·95 ; and in Canada 6·64.

The mortality of the Native Army of India is large. In the five years 1877–82, it ranged from 13·38 in 1877, to 37·79 and 41·12. In the last two years, in which there was much trying war service in Afghanistan, the death-rates in the regular native army of Bengal were so high as 53·61 and 53·15 per mille.

The death-rates in the General Population of India, as obtained in 1882, under a still admittedly imperfect system of registration, ranged from 13·61 in Assam to 29·99 North Western Provinces and Oudh. In Bengal the rate was 15·40; in the Punjab 27·03; in the Central Provinces

* Excluding troops serving in Afghanistan.

29·10; in the Madras Presidency 15·7, and in the Bombay Presidency 20·25.

Knowing the people and their modes of living as I do, I cannot but think that these rates are under-estimated and that, as the system of registration becomes more accurate, the rates will be found to be considerably higher. Still it is to be borne in mind that these are mainly rural rates.

Dr. Beddoe*, in an article on 'Mortality,' gives the following city mortality rates for 1878—Calcutta 37·7; Madras 48·8; Bombay 41·8. Nothing that parallels these rates has occurred to me in reading the recent mortality rates of the principal cities of the United Kingdom, one of the highest of which has been 29 per mille.

The death-rates of European Soldiers' Wives and Children in India have always been deplorably high. Macpherson shows that, between the years 1838 and 1853, the mean death-rate of women in the three Presidencies was 35·47 per mille.

The Sanitary Commissioner gives the rates between 1875 and 1882 as ranging from 19·78 in 1882, to 29·20 in 1878. My friend Dr. Joseph Ewart who has written† with great power on the "Causes of excessive mortality among the women and children of the European soldiers serving in India," says that, through the kindness of Surgeon-General Marston, he has been placed in a position to give, side by side, the death-rates of the women belonging to the European troops serving in India and in the United Kingdom; thus, one of the lowest Indian death-rates, that for 1882 being 19·78, the home rates for the four years 1877-80 were only 8·59, 8·65, 7·75, and 8·37.

The Children's death-rates, as given by the Sanitary Commissioner, are still more appallingly high. During the last eight years they ranged from 50·26 in 1882 to 79·73 in 1878. From the high authority cited above, Dr. Joseph Ewart shows that, in the four years 1877-80, the death-rates

* Quain's Dictionary.

† "Transactions of the Epidemiological Society of London," N.S., Vol. ii., p. 47.

of soldiers' children in the United Kingdom were 24·08, 28·41, 26·86, and 30·28.

The outcome of this dreary array of figures, to which you have listened with so much forbearing patience and courtesy, but which you will find to be of the most vital importance and interest when you come to study them in print, is that—although wherever we are able to draw an accurate statistical parallel, Indian death-rates are now generally lighter than they were in the evil old times of ill-built and over-crowded barracks and hospitals, battle, famine, and long campaigns, bleeding, calomel, and ignorant midwives—English men, women, and children are at present subject to far higher death-rates in India than they are in any other large division of the British Empire.

The following questions deserve the deepest consideration from sanitarians and legislators.

Why should the last decennial death-rate of our European Soldiers in India—19·37—so vastly exceed that of their brethren in the West Indies, 11.02, even when it is admitted that the pestilential influences of the West Indies are less potent than those of the East.

Why should the mortality of soldiers' wives in India be at present, to use Dr. Joseph Ewart's words, "about *three* times as heavy as in England?" We may well exclaim with him "the discrepancy is as enormous as it is appalling."

Still again, why should the death-rate among soldiers' children in India, in the four years 1877-80, exceed, as Ewart has shown, the death-rate of barrack children in the United Kingdom by 26·25, 51·32, 50·20, and 30·28 per mille?

In placing these facts in the form of questions, I do not mean to leave it to be inferred that the causes of these terrible discrepancies are not to a considerable extent recognised, or that the Government and their medical officers are not devoting the most earnest interest and very great ability to the work of amelioration, which recent statistics show is generally advancing. My plain object is to offer you a fair insight into the present state of public health

in India, that you may compare it—by no means in a spirit of exulting self-sufficiency—with the better, but still vastly improvable, condition of living which is vouchsafed to us at home.

ON CHANGE IN TYPE OF EPIDEMIC DISEASE.

By William Squire, M.D., F.R.C.P.

The question of change in type of disease is always one of great interest. It has often been raised with reference to the treatment of diseases generally; it may now be more profitably discussed in its bearing on epidemic disease, and specially in respect to variations observed in the microzymes associated with these and allied diseases.

Some such limitation of the question was seen to be needed before the germ theory of disease had acquired its present prominence. In considering the type of any disease we have to distinguish the mere pathological accidents, παθος, which may happen in any disease from the true disease, νοσος, to which it nosologically belongs. The type of a pleurisy or of a pneumonia is found to depend more upon its association with some epidemic, as part of influenza or of measles, than on the age or strength of the patient; and, many an instance of alleged change of type of disease has resulted from the presence or varying potency of some epidemic cause.

In the healthy individual, or one under the influence of a diathesis and not of any epidemic, chill or fatigue may be followed by violent reaction with increased blood-pressure, arrest of the circulation in some part of its course, and effusion or other product of disease, hardly distinguishable from the results that would follow had the original depressing cause been an infection received into the body, and not one operating from without. It is well known

that chill and fatigue greatly predispose to the reception of infection; it may be that under such predisposition an epidemic cause, already weakened or subsiding, will either repeat itself with considerable intensity, or modify the resulting illness so slightly as to be hardly recognisable and the epidemic character denied; or, if recognised, be so modified that the epidemic is said to have changed its type. This is not so, however; the epidemic cause remains the same and the germ on which it depends has undergone no change; for, take the instance of idiosyncrasy acquired by one who has previously suffered from this particular epidemic disease; however modified the disease may be in this person, it is reproduced with all its violence in another susceptible person.

Besides these variations in intensity seen in most epidemics, and in any part of their course, there are two great cyclic variations commonly observed, and so marked in some of them as to be characteristic; these are, the rise and decline of epidemics at certain seasons of the year, and their tendency to special prevalence and malignancy at more remote intervals. Without prejudging the main question, it is right to insist on the importance of this variability of type, well established by long records, as compared with the evidence of change of type brought forward from time to time; also to mention that some of this evidence may often be referred to change in the attitude of the observer rather than to change in the nature of the disease. In illustration, it is sufficient to mention the spread of small-pox with us in the first half of the year, its increase in June, and its subsidence in the third quarter of the year, as proof of the first mode of variability. The second has received a remarkable illustration of late years. Hardly had Trousseau mentioned in his clinical lectures, vol. ii. p. 74, New Sydenham Society's Translation, a virulent or hæmorrhagic form of small-pox as described by the ancients, when, in 1860, two rapidly fatal cases came under his observation. We all remember how this form was largely repeated in 1870, and I can recall two cases in

and near London, of well-nourished robust men who fell victims to this cyclical recurrence to the old type of small-pox. Another variation, not a persistent change of type, is shown in the roseolar rash accompanying the eruption of small-pox recently. Moreover, modified forms of small-pox were known to Sydenham. Trousseau mentions such cases, p. 82, as occurring in 1854. As an instance of the change of view an observer may introduce, I may refer to some quotations from Borsieri in the same lectures; he gives instances of recurrence of small-pox in the same individual, cases not unknown even now, but evidently impressed with the fact that many of those diseases might recur, he asserts that rubeola notha—Rubella—which Trousseau thought might recur, not only conferred no immunity, but that one attack actually established a predisposition to recurrence—"qui semel iis laboravit, facile iterum pluriesque prehenditur." It has been the fashion of late to claim the same prerogative for diphtheria. Doubtless there is a difference of degree in the extent to which epidemic diseases confer immunity on persons who have suffered an attack. Measles probably stands highest in the amount of protection afforded by one attack against a recurrence. I have seen instances of protection afforded by rubella. Scarlet fever protects less well from liability to recurrence, but enough for this power to be universally recognised. This power is denied by some to diphtheria, as it has been to rubella, still I have observed some degree of protective effect exercised, and am sure that many of the recurrent cases reported involve errors of observation. The variation in type of an epidemic such as small-pox, and reversion to its severer forms at long and uncertain intervals, is also noticed in respect to measles, but with this difference, that in the worst outbreaks of measles some secondary cause, as exposure, neglect, or overcrowding, is generally associated with the excessive fatality.

A much more striking example of variability of type is shown by scarlet-fever; indeed, great variability is one of the most marked characteristics of this epidemic; it seems

to be an integral part of it, and not dependent upon accidental circumstances, at least not upon such as are at present defined or understood. Some of the least hygienic abodes escape, the best sanitary precautions are no defence against it. For some years epidemics of it are so mild in character as to be little heeded, again it returns with all its terrors. Graves mentions that scarlet-fever, so fatal in Ireland at the beginning of this century, had ceased to alarm; and that credit was taken for the improved method of treatment, avoidance of bleeding, and a better knowledge of the disease, for this lessened fatality, when, from 1831 to 1834, an epidemic of it more fatal than typhus or cholera raged over Ireland. Bretonneau describes exactly the same thing in France in 1824 and later; now scarlet fever prevails less in France than with us, still cases of great severity appear there as well as here. It has become a classic assertion that in Sydenham's time scarlet-fever was a trivial disease in England; this is doubtful, and I think his description would apply to rubella rather than to scarlet-fever; severe cases of it are described as confluent measles at that time by Morton. The subsequent writings of Huxham, Withering, and Heberden, show that no change of type has set in during the last two centuries, while the writings of Sennert, Forest, Baillou, and others, show scarlet fever to have been a severe disease long before then. Diphtheria is closely allied to scarlet-fever throughout its epidemic history, and in no one particular more than in this wide variability, both in respect to the long intervals often observed between severe outbreaks, and in the degree of severity in different cases in the same epidemic. Heberden observes of it: "This distemper is sometimes so slight as to require no remedies, and sometimes so violent as to admit of no relief." (Commentaries. London, 1802, p. 25.) He describes a case fatal in the sixth day, where a membrane covered the uvula, and was found in the trachea nearly to its division (p. 27). As to the capability of this fever to infect the same person more than once, he goes on to say: "According to my experience, some

children have, beyond all doubt, been afflicted a second time with this disease; but it is evident that this happens very seldom; for otherwise, in such a common distemper, there could be no more question about the possibility of a second infection than there is in the itch, or in venereal disorders."* Epidemic disease requires wide study to be well known. Diphtheria is no new disease with us; for proofs of severe epidemic, occurring at long intervals, we may compare Huxham's and Fothergill's account with our own experience of 1858–59, or refer to the Spanish writers of the seventeenth century.

Persistence of type with variability of manifestation, would thus appear to be an attribute of most of the epidemic diseases. But it may be contended that variability of germ might be induced through a long series of propagations or by difference of media. I do not propose to deal with this part of the subject, but remark, that in the Report of the Local Government Board for 1881, Dr. Klein found pathogenic and septic bacteria not mutually transmutable; the great variation of activity of these organisms reported, corresponds well with what has been noticed as to the variability of epidemic disease; the degeneration produced in bacteria by the cultivation in an exhausted medium decreased their numbers and produced some imperfect forms; but some of the bacteria were unaffected, and retained their old potency; the infecting power was less, because the number of infecting particles was less, but the characteristics of the germ were unchanged. I conclude that either the epidemic germ would die out altogether, or give rise to a new form transmissible as such, and rarely if ever reverting to that from which it was derived. Thus vaccinia or varicella may have been derived from variola, rubella from rubeola, scarlet-fever from diphtheria, or *vice versâ*, but these types are now distinct, and will not change one into the other. But there is no kind of relation between typhus and typhoid

* Op. cit. p. 28. In one of its forms the last instance is questionable; and in face of Colles' law can no longer be affirmed.

fevers. Typhus fever, rarely seen among us, is still when it comes typhus. We hear more of enteric fever now, and though less frequent in England than formerly, or elsewhere, it differs in no respect from the typhoid, or common continued fever, of bygone times.

DISCUSSION.

The CHAIRMAN said that every medical man present must have heard this paper with the deepest interest, for it must have touched the experience of all, not only of the very experienced, who, like himself, had lived to see disease almost entirely change its character, as an actor on the stage might change his dress, for though he was Irving in this dress, and Irving in that, still he was the same Irving as he was before; so it was with disease, and the youngest medical man present must have experienced much of that which Dr. Squire had described. In fact, it may be said, that medical men never had seen, and never would see, the same precise type of disease in two outbreaks, nor the same case of disease in two individuals. This was particularly the case with regard to many diseases which prevailed in India. He might mention an interesting fact: about forty years ago a very experienced and judicious medical man, Dr. Greenwood, of London, remarked that cases of typhus fever were then of such a low ataxic type that you could not apply a single leech. His opinions had not changed, but the disease that he used to see, between thirty and forty years previously, was a disease of high inflammation, in which not only did the patient bear leeching and bleeding, but the disease, as he recollected it, demanded those strong heroic measures.

Mr. LIGGINS said, as a West Indian and a traveller, he might be excused for making a few remarks on yellow fever and cholera. During many years he had the opportunity of visiting the West Indian Islands, and often heard

those diseases talked about, but he believed it was twenty years since a case of yellow fever occurred in the West Indian Islands, and it was generally admitted to be a disease of a very mysterious nature. The same remark applied to cholera. Some thirty years ago, during the epidemic of cholera, he travelled through the West Indies, the United States, and Canada, when that disease was so terrible that he remembered at one o'clock travelling in a steamboat the length of Lake Erie, on which twenty-five persons had died of cholera during the night. It was a common thing to see people, strong and hearty agricultural labourers, and navvies, lie down by the roadside and turn blue and die. If the medical skill of our age could suggest any steps to be taken which would avoid our liability to such disease, it would be of great value, particularly at the present time, when they must all feel a deep sympathy with our neighbours across the Channel, who were suffering from this most terrible onslaught of this disease. It was true that we were surrounded by pure sea water, which, as Shakespeare said, had been our grandest defence; but still it might be our misfortune, through the laxity of quarantine precautions, to be visited by this epidemic.

The SECRETARY stated that the question of cholera would be discussed on the following day.

Surgeon-Major PRINGLE said he had only lately come back from India, where he had been for thirty years, and had had an opportunity of seeing two instances of epidemic cholera, in one of which sanitation was noted by its complete absence, and in the other it might be called sanitation in excelsis. The first was on the occasion of a Juggernaut festival, when there was no sanitation of any kind whatever; the people were dying in hundreds all round. After this had continued a certain time, it appeared to die out on its route into Bengal, without spreading as subsequent epidemics had done. The other place in which he saw a severe cholera epidemic was Hurdwar, in 1879; and if ever there were sanitation in excelsis it was there, for never was a whole district more devoted to sanitation, and

never did it prove a more signal failure. Allusion had been made to the poor diet of the natives, and he remembered on one occasion being in Pooree when over a million maunds of grain were lost in a flood, but not a single person felt that loss, because there were stores of grain in the country. A few years afterwards, at the time of the Orissa famine, the old grain was gone, having been exported, and its representative was seen on the arms of the men and women in the shape of bangles. With regard to irrigation, he had ridden up and down the most irrigated parts of Hindostan for the past twenty years, and he must say, if irrigation had done much, the poor creatures who had got it had paid dearly for it. Theory was all very well, but a good actual stubborn fact now and then was very useful also. In the Deobund Doab they now had at last a system of irrigation complete, and there before this canal they never had the least famine, when all around were suffering from it. The very important subject, to which Dr. Chevers had alluded, the continual low diet of the people of India, had never been brought properly before the public mind. The same thing was going to happen in the north-west provinces; the wheat was being taken away, and the people were living on grain food which was far inferior to wheat; he had seen them picking up green food in the fields only fit for goats, and he heard a poor woman say, when a remark was made on the splendid harvest, "what was the use of it to them, it did not affect the price, and they would not get any of it." It would be a long time before wheat reached Bengal at the present prices for the poor to eat. No one who had travelled much about India, and gone in amongst the natives as he had done, could fail to see the terrible mortality from what was called secret-famine, the people not being thoroughly fed, just dragging on a miserable existence between life and death. A good harvest meant a little enjoyment, but the least turn of the scale brought hunger at once. For twenty years he had been riding up and down the Doab, and never saw such a harvest as there was last year, but he believed the greater part of it was in London now. Natives

had told him that there was enough grain grown to last for two years, and of course that was the real insurance against famine. In good years, when all the rice was sold, you might see women with bangles all up their arms, but when the rice failed those bangles were put into the market. When they were made, they represented rice at thirty, forty, or fifty seers to the rupee, but when they were melted down, they would not obtain more than six seers to the rupee, and so it would be with Government insurance, unless some steps were taken beyond providing railways. The natives last year said many of the rich merchants were laying up vast quantities of wheat, and when they were asked why, they said "they could not expect a crop like that next year;" there never was such a harvest. Not only so, but the season was most suitable for the storing of grain. The best harvest that was ever reaped was of no use in India unless it could be stored dry. In conclusion, he feared a little cold water might seem to have been thrown on the efforts of those who were sending out qualified ladies to India, which he thought would be a pity. No officer who had examined, as he had done, the mortuary returns, but must have been struck with often seeing a birth and a death close together, which simply meant the grossest mismanagement. As to European medical men going into the Zenana, and attending ladies, he was quite sure that that was not on the increase, and there was not the least doubt that properly qualified ladies, not those with simply a mere smattering, could be of great use out there in numerous ways. The upper classes in the north-west provinces were perfectly different to what they were in Bengal; they were far more numerous, and he was quite satisfied there was scope for qualified lady doctors out there.

The CHAIRMAN said that, with regard to the storing of grain in India, he might mention one circumstance which would give some idea of the difficulty attending this measure. In Patna there is a great building which towers far over the other buildings, looking like an immense bee-hive; it was

intended to be only open at the top, although there is an entrance on the level; it could only be compared in size with the dome of St. Paul's. This was provided as one of the great store-houses or granaries, in which should be placed the grain cultivated in the very fertile Soane Valley, near Patna. When it was constructed, some arithmetician began to work out the figures, and it was found that this enormous reservoir would only contain sufficient grain for one day's consumption of the population of Patna. The storage of grain in India is, at present, an almost insoluble problem.

Mr. ARMSTRONG, of Newcastle, said the remarks he had to make were intended to apply solely to the second Paper, and were chiefly of a statistical character. Before dealing with the figures, he might say they referred to a period of one hundred years, and were derived from the returns of the Newcastle Dispensary, which institution he had been familiar with for twenty-five years, and had for several years been medical officer to. The subject of the change in type of disease was one which affected the public and also the profession. There were three ways of judging of change of type; first, what might be termed the general one, the way in which a medical man gauged the severity of his own cases; the second and third methods were merely statistical, and in one sense were less liable to error. The first method was liable to error of a kind which it was impossible to gauge properly, arising from the particular views which the observer himself took of his own cases. For instance, after an experience of some fifteen years at a fever hospital, where typhus was the principal disease, for some time his (the speaker's) own views as to typhus fever had been considerably modified, and cases that some would accept without question as typhus, he should not now accept, as his experience had taught him to eliminate from true typhus a large number of cases sent in supposed to be suffering from that disease. Such a change of opinion would have a large influence on the supposed mortality of any special disease; the statistics he

would produce presently would show a wide difference in mortality, from which it might be argued that change of type alone was the cause; but he was convinced that this alone was not the cause, and that greater accuracy in observation, as regarded typhus, at all events, had partly led to this result. With regard to typhus, this very question had taught him that it was not safe to rely on statistics for a period of 100 years, owing to the modification of view which had taken place generally. We now know a great deal more about enteric and allied fevers than we did even ten years ago, and much more than we did thirty or forty years ago, and, therefore, it was not advisable to attempt, in dealing with so long a period, to draw distinctions between typhus, typhoid, and other allied fevers, and accordingly those diseases he had classed together. He found from the books of the Newcastle Dispensary, beginning with the commencement of the institution in the year 1778 to the year 1878 inclusive, there were 18,470 cases of typhus and typhoid fever; 6804 scarlet fever; 4686 measles; 2639 small-pox. With regard to the statistical question of the prevalence of typhus and typhoid fevers, he had divided the 100 years into periods of 30 years each. During the first 30 years there were 5332 cases, or an average of 177 per annum; during the second 30 years 4326, or an average of 144 per annum, with an increase of population; during the third period, 7313, or at the rate of 243 per annum; and during the last ten years of the century, 1499, or at the rate of 149 per annum, with a much larger population. During this same period of 100 years, the mortalities had been as follows:—At the beginning of the century, 1778, 6·3 per cent.; in 1793, another slight epidemic, 4·8; in 1801 to 1804, when the fever-hospital was opened, 6·7; after that time he did not take the percentages, because, most of the cases being taken to the fever hospital, the returns could not be relied upon. The mortality at the fever-hospital during the last 8 or 10 years, always exceeded 10 per cent., and during active epidemics it had been 15, and sometimes 20 per cent., but these rates

referred to cases of what he should now call undoubted typhus. Enteric fever had also apparently increased in mortality. From this, one would argue that the disease was more severe, but it was also possible that at the beginning of the century many cases were included which were not properly fever. Passing on now to disease which was more reliable as regards the statistics, namely, scarlet fever, the figures were as follow:—The total cases were 6804, with a general mortality of 11·5 per cent.; during the first 30* years the mortality was 7·2; the second 30 years, 5·3; the third 30 years, 14; and the last 10 years, 14. One epidemic year of scarlet fever had been in 1846–7, when the mortality was 12·2; in 1856, it was 19; in 1861, it was 20; in 1867, it was 18; in 1869, when it was 11; and in 1873–4, when it was 19·2. Another disease in which the statistics were fairly reliable was measles. The total cases during the period was 4686, and the general mortality 5·8 per cent. During the first 30* years it was 8·5; the second, 5; the third, 6; and the last 10 years, 4 per cent., showing, therefore, an improvement with regard to mortality. But one must not be too hasty in inferring from that that measles was dying out, because in the year 1873 the north of England was ravaged by a very fatal epidemic of measles, much more fatal than any in those statistics. With regard to small-pox, the total number of cases in the century was remarkably small, being only 2639. During the first 30 years the mortality averaged 12 cases per year; during the second, 22; the third, 37; and during the last 10 years, 40. Those statistics were very much vitiated by the fact that small-pox was relieved at the fever hospitals, and he did not think any fair inference was deducible from them. With regard to the point mentioned by Dr. Squire as to the type of disease, he was fully prepared to confirm what that gentleman had said about hæmorrhagic small-pox. In 1871–2 he (the speaker) was anxious to get information on small-pox, as, like other living medical men,

* Less two years for which information is defective.

he had not at that time had an opportunity of familiarising himself practically with the disease. He found, however, that there were no modern books which were of much use; they gave the stock-information on the subject, and very little more, and in order to learn what small-pox really was, it was necessary to go back to the writers of old times. Any of the old writers, before the times of vaccination, gave ten times as much information as the writers of post-vaccinal times. The old writers—English, Continental, and Arabian—gave information fully bearing out that the small-pox of the past was being, as it were, repeated in the present time. With regard to change of type, in 1871–2 he was struck by one thing, which he had not seen observed in any works written on small-pox either before or since, viz., that there were certain temporary changes of type which passed over the face of the epidemic, so to speak, from time to time; sometimes for a month a run of cases would occur which were distinctly of the same kind, then in the following month there would be something different, say, hæmorrhagic cases; then a run of cases with a large amount of roseolar eruption; then a reversion to one of the other forms. This was a feature which he had pointed out to medical friends, who fully recognised it.

The CHAIRMAN said it was just the same with Indian cholera, the type was constantly changing, you never saw two types in any sense precisely alike, or two patients exactly alike, any more than you saw two sheep or two men precisely the same.

Mr. ARMSTRONG said with regard to the cause of this change, he thought at first that meteorology might help to explain it, but it certainly did not to his mind. Then it occurred to him that possibly local sanitary conditions might have something to do with it, or possibly meteorology and sanitary condition combined, for he firmly believed that the virulence of the disease was in direct ratio to sanitary conditions but he was not able to produce anything in the way of direct proof of this belief.

Lastly, he would refer to deaths from second attacks of small-pox. He had had one or two cases where he had satisfactory proof that a person died from a second attack. There was one unvaccinated person who died in the small-pox hospital of Newcastle last year; he was aged about 33, and died from confluent small-pox. This patient's mother stated that when her son was born she had suffered from small-pox, and that the baby took it when about ten days old, and recovered, and in consequence of having this attack he had not been vaccinated as the other members of the family were.

Surgeon-General JOHN MURRAY said he remembered a case in India of a man who had a severe attack of small-pox, who told him he had had it twice before.

The CHAIRMAN said small-pox was expected in Calcutta about once in every three years, and it was generally severe, but was looked upon merely as the ordinary small-pox; but one year it was so virulent that all protection, whether inoculation or vaccination, appeared to fail entirely. One case struck him very much; he had not a great deal to do with these patients, but his colleague and he had wards which communicated by arches, and, as he was going along with his pupils one day, he said to them, "Surely that must be a case of small-pox," and they stopped and looked at the man through the arch. He said it was exactly like small-pox, but it could hardly be so, because the man was seamed and furrowed by a previous attack of small-pox. The man had small-pox. He believed that he recovered. It was undoubtedly within the power of small-pox to break through all protection.

Surgeon-Major PRINGLE said he remembered a very remarkable case of that kind, in which he was ordered by the magistrate to inquire into the effects of vaccination as a protective from small-pox. He had every case of reputed small-pox after vaccination systematically inquired into, they were all collected, and he went carefully over them. Every case, without a single exception, proved to be one of chicken-pox and not small-pox, and, owing to the

season of the year and the neglect of the parents, a high rate of mortality followed these attacks in the persons of very young children. During this inquiry one man, an adult, came up with the small-pox eruption on his face, this was a secondary attack, while the body was covered with the cicatrices of the primary. Still, after twenty years' close experience of vaccination, in which he devoted his whole time to it, he must honestly say he had never yet met with an epidemic of small-pox where systematic vaccination from arm to arm was carried on. Small-pox on one occasion broke out in one of his "Lymph nurseries" in the Himalayahs, but the contagion or infection had been brought with the sugar from the Plains of Hindoostan, which had been found to contain a few small-pox crusts, swept up with the sugar from the floor no doubt.

Dr. CULLIMORE wished to ask if Surgeon-Major Pringle had ever seen in India or elsewhere any of those preliminary rashes, which had been spoken about of late, somewhat of the character of measles, which were supposed to usher in or precede an attack of small-pox. He had never seen anything of it himself, and did not know whether there was any foundation for it. Again, with reference to deaths occurring from a second attack of small-pox, he knew a case of a distinguished Indian medical officer who was pitted with small-pox having had two attacks; he was afterwards sent to Bagdad as political agent, and died there from a third attack. With regard to scarlet-fever, Sir James Paget had mentioned a form of scarlet-fever which occurred after cases of surgical operations in hospitals. There was some dispute about it, but some authorities were of opinion that it occurred independently of any infection whatever, that it was a disease *per se* connected with the operation; whilst others were of the opinion, which he believed to be the correct one, that the operation was only the predisposing condition. With regard to typhus and typhoid fever in India, they were exceedingly rare in former times, in fact during his own experience there, particularly during the time he

lived in Mandalay, which was two years altogether, and he had a good deal of practice amongst the natives as well as Europeans, he never saw a case of typhoid, but now it seemed to be getting more prevalent. He thought probably the disease had been sometimes introduced into India through the Suez Canal, and might have been connected with the change in the way in which the Army was formed, namely, that of doing away with the old soldiers, and the introduction of young troops, who were continually passing from this country to India. At any rate, it was a well-known fact that this disease occurred principally in the large military stations; for example at Bangalore, one of the largest in India, it spread from the troops there and attacked large numbers of the natives, but he did not believe it occurred very much outside those stations. Typhoid did not seem to decrease in the same way as typhus, which was now almost extinct in England, though there were still cases, for he saw one last winter. Possibly the spread of typhoid fever might have something to do with the water system of drainage, which facilitated the spread of the germs.

Brigade-Surgeon SCRIVEN said he believed cases of enteric fever were known in India as long ago as 1851, and the causes were the same there as they were in England.

Surgeon-Major PRINGLE said that he called some cases of typhoid fever in India "lawn tennis typhoid." He remembered a case of two officers being laid up with it, but being carefully looked after, they recovered so admirably that one went out almost immediately at the head of a shooting expedition. The fact was that they both got bad chills, and it was put down to typhoid fever.

Dr. LAWSON (Inspector-General of Hospitals), said there was a factor in disease, as we saw expressed in statistics, which had not been allued to, namely, the effect of change of treatment. They were apt to think of any change of treatment as an improvement, but if they looked calmly at the results, it did not always appear so striking. With regard

to fever, for instance, in old times typhus and typhiod were classed as the same disease. In the latter part of the Peninsular war, the wounded suffered very much from hospital gangrene, especially after the battle of Vittoria. That induced the authorities in a subsequent action in the Pyrenees to keep them moving in the field on the Pyrenees, and they then suffered from it no longer. Subsequently at Toulouse, finding they had been successful in the Pyrenees, Mr. Guthrie paid great attention to the subject, and again after the battle of Waterloo the same thing was continued. He had recently had occasion to refer to all these statistics, and found that, taking amputations of the leg, the thigh, or the arm, the mortality following them was exactly half of what had taken place in the Crimea after the first of April, 1855. Before that, owing to the great hardships the men had to suffer, and being insufficiently attended to, the mortality was much greater, but after the first of April, he yet found that taking the whole of the amputations, the mortality was as nearly as possible double what it was in the days of Waterloo. He could not help thinking that this change was owing not a little to the change of treatment. In those times the lancet was freely used, and evacuant medicines and low diet, but if they referred to the practice of subsequent times, anyone who thought of applying the lancet would be looked upon as committing murder, the strength was supported and so on, but the result of that was mainly shown by the fact of losing two men where one was lost previously. It was very important to keep in mind this factor of the change of treatment in considering the mortality of disease.

Surgeon-General MURRAY said, with regard to the change of type in disease, alluded to by Dr. Lawson, he thought disease in general would be found connected with the sanitary arrangements of the hospital; crowded and bad sanitary arrangements would produce hospital gangrene, where free ventilation kept it off. During the Sutlej campaign there was a great deal of hospital gangrene at

Furzapore. After the battle of Ferozepore the sick were brought in from the field, and arrangements were made to have them all placed in separate buildings in the old hospitals. When he came to look at the wounded after the battle, he found the men all crowded in a native palace, which being under the fort, was supposed to be a safe place, but they were so crowded that he had to walk over one man to get to another. They had only been two days there, but hospital gangrene had already made its appearance. The whole of the men were spread out that evening, and the gangrene disappeared immediately.

Dr. SQUIRE, in reply, said there were two views in regard to the change of type in disease; one was the idea that the disease changed its type, and became milder—that there was a milder form of scarlet fever, or of typhoid fever, but he did not consider that was exactly the point to which he should direct his attention most, because it was admitted by all, that there was that variation of type, that there were these mild cases; but what he contended against was the idea that this modified type became permanent; of this he had seen no evidence, because the mild cases seemed ready to set up the severer form at some other time. Any notion of mixed or hybrid zymotic disease was impossible; it was contradicted by the frequent experience of two of those diseases co-existing in the same person without change in either of them, and by all that was known of the conditions under which the germs of those diseases could multiply. The conclusion, therefore, appeared to him to be that there was a persistency of type, which probably the majority present would be disposed to accept, perhaps, with some limitations, which had not been referred to in the discussion. Dr. Lawson had referred to the effect of change of treatment in disease. He had alluded to that in the paper, but perhaps too slightly. As to scarlet fever, both in France and in Ireland, the remark had been made that probably the lowering treatment had had a bad effect on the epidemic. In the next epidemic there was no excessive bleeding, no reverting to the old

type of treatment which was thought to be so injurious, and yet the fatality was as great as ever, if not greater. So in every epidemic of cholera as the cases became less severe the lessened death-rate is attributed to the last specific remedy or plan of treatment advocated. There were different kinds of changes of treatment, for instance, such as had been referred to of too much or two little stimulants, bleeding, and the like. There was again another kind of treatment which has the greatest effect; in several instances the mortality in isolated epidemics of measles has been reduced from 40 to 4 per cent., or lower. This showed what could be done by the treatment of measles with fresh air, the requisite supply of food and liquid and good nursing Typhus cases when given plenty of air space did not become very serious, the recoveries were much greater than when they were treated in confined and insufficient air space. In some diseases, therefore, they had found the conditions in which they might be managed and treated in a favourable way, so as to give ground for the hopes that they would acquire a very mild type, and not show themselves in their severest forms; but when not prevented they reverted to the old type, which seemed to recur unchanged. One explanation of so much of what they read as to change of type in disease, was the change of observation; the change of view, not change of type. No doubt at one time all cases of severe disease were called cases of typhus fever. The illness might have been meningitis, or acute pleurisy, but still being accompanied by high vascular tension and a state of fever it was called typhus; such cases were bled, and no doubt, properly bled, not because bleeding was proper for typhus, or that the type had changed, but because they were cases in which bleeding was the means of giving immediate relief.

The Conference then adjourned till 11 o'clock on the following day.

CONFERENCE ON WEDNESDAY, JULY 23, 1884.

The President took the chair at 11 o'clock.

SUBJECTS FOR DISCUSSION:—

3. "*Leprosy in India, and the Best Means of Preventing its Increase.*" By SURGEON-MAJOR R. PRINGLE, M.D., Sanitary Department Her Majesty's Bengal Army.

4. "*Remarks on the Aspects of Cholera in Europe and Elsewhere.*" By ROBERT LAWSON, Inspector-General of Hospitals, late President Epidemiological Society, Fellow of Statistical Society.

LEPROSY IN INDIA, AND THE BEST MEANS OF PREVENTING ITS INCREASE.

BY SURGEON-MAJOR R. PRINGLE, M.D.,

Sanitary Department Her Majesty's Bengal Army.

MR. CHAIRMAN, Ladies, and Gentlemen :—The subject on which I have been asked by the President of the Epidemiological Society of London to prepare a paper is that of Leprosy in India, and I am glad I have this opportunity of eliciting an opinion on the best means of preventing its increase, and of pleading for the poor lepers of India, as I am satisfied, that the absence of any means whatever to prevent the increase of leprosy, for reasons I shall give hereafter, is tending to the production of a marked increase of the disease; and though in an insidious manner up to the present time, yet in a few years this increase will be

very apparent and considerable, and its reduction hereafter may prove to be a very difficult matter. The benefits, however, of the adoption at once of suitable means to check the increase will be quickly visible, and as the disease is purely hereditary, and being neither contagious nor infectious, I see nothing to prevent its removal in process of time; for if the disease has been considerably checked, or at least kept in check, by the native mode of *removing* the cases likely to be instrumental in its increase, I repeat, I see no reason why, in course of time, if the asylums I advocate are judiciously conducted, the disease might not almost die out, and this happy result be attained by a line of practical sympathy and kind treatment, which will for ever mark the Christian rule in India, and be a monument of the British power more lasting than any we could raise. In alluding to this subject I shall purposely omit the employment of any professional terms, as I feel they might act as obstacles in the freedom of the discussion, which I hope will follow; nor shall I take up the time of this meeting by entering into any details of the disease itself, nor yet allude to any mode of treatment properly so called; as I may state as the result of my experience for thirty years, that I have never seen or heard of any remedies, which appear to have the very least beneficial effect on the disease, when those terrible and unmistakeable dark brown raised patches are seen. The poor leper knows when they appear he is beyond the reach of all human aid, and a life, which will be a burden to him till the day of his death, is his lot till that time arrives. The natives themselves both know and feel that no remedy or line of treatment is of any benefit when the disease has unmistakeably appeared, and, as if to prove this, I may mention what happened in my own experience last year in the Himalayahs. While engaged in vaccine and sanitary duties in the Jounsar district of the Himalayahs, I heard from some natives that a Brahmin had appeared in a village not far off, who professed to cure Leprosy as a god, that is, by the word of his mouth, and that a number of *slight cases of* the disease had gone to visit him. This

Brahmin proved the divinity of his power in a remarkable manner, so the natives told me, and they, knowing the great interest I took in the disease, seemed very anxious that I should see one of the cases he was going to cure, it was a well-known case, being in the person of the head man in one of the largest villages in the district. I accordingly marched to the village, and saw the poor sufferer; my first visit was paid in May, 1882, my second in October, 1882, and my third in June, 1883. On my first visit there was a remarkable look of faith about the poor man, that is to say, though the disease was well developed, the sufferer firmly believed in the divine power of the Brahmin, and the truth of the proof he gave of the divinity of his mission and when I asked the poor man what were the grounds of his belief, he said, "I asked the Brahmin what medicine he was going to give me?" "Man thinks he can cure Leprosy by medicines," said the Brahmin, "but I cure it like a god by the word of power." This appeared to completely convince the man, and fully accounted for his hopeful look as regards recovery. The cure was to be completed in a year, but there was to be marked improvement and benefit in six months. At the end of six months the hopeful look was gone, and at the end of twelve the poor man, with a manifest alarming increase in the symptoms, looked the very picture of despair, feeling that nothing but his position in the village kept him there for a little longer. The proof the Brahmin gave of his divine power was the following: and he gave this proof before he undertook the cure of the first case. The Brahmin selected a little stone temple on a hill side, and telling the villagers to collect bundles of dry wood, when they were placed round the front of the temple he entered it, and ordered them to set the wood on fire, and added, when you open the door, and look in, after the wood is burnt, if I am a man I will be consumed, but if I am sent from God I will be seen sitting by the idol. The man had made his arrangements to get out of the temple at the back, and remained hidden in the jungle till the temperature of the inside of the temple had cooled, and then he

entered, and sat down by the idol, and when the villagers entered through the door, which of course was much longer in cooling than the back of the temple, they saw the Brahmin sitting by the idol. My reason for giving the details of this case is, that I have never heard of any similar design to prove the divinity of a mission, and that I think it shows in a remarkable manner the hopelessness, in the opinion of the natives, of attempting to treat those cases by any medicinal treatment, either local or otherwise.

None can picture the misery which breaks in on the poor sufferer, when he knows his or her fate is sealed, and a few days sees him a wanderer from his home, too unclean to enter heaven, though he be a heaven-born Brahmin, as no Hindoo will assist in the burning of his body. True the community of suffering bands them together, and the poor leper, when he leaves his home as an unclean outcast at once joins a band of lepers. I have seen these poor creatures from Juggernauth to Hurdwar, and even near Gungootree, and have often felt that they seemed "the uncared for in India"; though at Juggernauth I did what I could for them, and at Cuttack, in Orissa, as superintendent of the Unnochuttar, a place for the daily gratuitous distribution of cooked rice, took care they were not forgotten; but it was not till many years after, that I saw in the Dehra Dhoon, a building which will ever be remembered, even though the Government allow it to fall into decay, as private means cannot always be forthcoming to keep it up, as a memento of the late Shikari Wilson, *the friend of the sufferer*, and the Dehra Doctor Sahib (Surgeon Major G. G. McLaren). In this building are collected about seventy lepers of both sexes, and of all ages, and I know not any spot on earth which in a more remarkable manner speaks to the Hindoo and Mahomedan of the religion of "Him who went about doing good," than the Leper Asylum, of the Dehra Dhoon and Mussoorie; and I think I can best plead for the lepers in general, and this building in particular, by giving extracts from my annual Sanitary Reports for the past four years, and when I state that the allusion in these reports has not

elicited even any reference to the subject in the Government orders on the Sanitary Reports of the Provinces, much less the grant of a few rupees towards the support of the asylum, both the urgency and the necessity of my appeal will, I think, be self-evident. The Asylum for Lepers in the Dehra Dhoon was opened for the reception of these poor sufferers in 1879, and the following is the report of my first official visit, as taken from my Annual Sanitary Report for 1879-80.

"Paragraph 60. It may not be out of place to allude here to an official visit I paid to the Leper Asylum at Dehra, and if the following few remarks enlist an increased interest in this most deserving institution, I shall be only too glad. I need hardly state that my visit was quite unexpected. As regards the site, this is most admirably chosen, in one of the driest and most healthy spots south of the town of Dehra, and as free from malaria as it is possible for this portion of the Dhoon to be. The buildings, in my opinion, exhibit in a marked degree the two great requirements of charitable buildings in the East, viz., first, perfect adaptation for the purposes for which they were constructed; and second, the attainment of this without any unnecessary expenditure, and yet the erection of buildings both durable and free from the risk of fire. The inmates, old and young, who on the occasion of my visits numbered sixty-eight, were at their evening meal, and the comforts enjoyed by these poor creatures, though of the most trifling description, were most gratefully received. In short I have never paid a visit, either official or otherwise, to any charitable institution from which I have derived more pleasure than this. To see these poor afflicted creatures, both looking and really feeling contented must be a rich reward to all who have interested themselves in this truly deserving institution, and I therefore refrain from alluding in detail to all Dr. McLaren and others have done for these sufferers, feeling satisfied that a visit to the institution is the truest, as it is the best reward they can ever wish for. How different was the treatment these poor creatures received in olden times and I see no

reason to question the veracity of the reports), viz., that they were *removed* in various ways; or if this was not done, the possibility of its being done to them appeared so probable, that they left their own part of the country rather than run any risk. This Leper Asylum spares the community at Dehra and Mussoorie many a sad sight, and for this cause alone it is deserving of the support of all who visit these hills in search either of health or pleasure. For, till this asylum was created, the Mussoorie Municipality, as I know, felt unable to carry out the by-law which related to these poor creatures sitting and begging at the road sides. For some reason or another no support is granted towards this institution from the state—though if ever a portion of the community might be considered the special care of the Government, it is that part of it afflicted with leprosy as met with in this country—and therefore the entire funds have been and are collected from the public."

The following is the allusion to the Leper Asylum in my report for the next year, 1880–81.

"During the past season I have visited the leper asylum at Dehra, and, as in the previous year, found everything in a most satisfactory state. There were seventy-three inmates on the day of my visit, which I need hardly state was quite unexpected.

"So important do I consider these leper asylums to be, that, were the Government to consult its pecuniary interest alone, independent altogether of its duty to the nation over whom it rules, it would establish leper asylums wherever the disease is believed to be endemic, and by gathering these afflicted people within these buildings, enable them to end their days in comparative comfort, and without handing down to a posterity the distressing complaint from which they have suffered, it might be so long and so much. The systematic establishment of leper asylums would effectually break up these communities of lepers, by whom, without doubt, the disease is not only kept up, but for reasons which I will give hereafter, must go on steadily increasing. These reasons may be summed up in stating that, now

that the treatment adopted by native rulers in these countries, where this disease appeared to be endemic, for stamping out the disease, is put a stop to (viz., of getting rid of the adults known to be afflicted with the disease, whether male or female, in various ways, before they were able to add to any considerable extent to this diseased section of the community), an alarming increase must necessarily take place in the number of these afflicted people unless some steps are taken to prevent it; and if no other cause were present to induce the Government of the country to take measures to prevent the possibilities of this occurrence, by the systematic establishment of these leper asylums, this likelihood of the increase of leprosy would alone demand some action on the part of the ruling powers.

"It is impossible to give any approximate idea of how insidiously this terrible disease may be propagated throughout the country, but I have little doubt that, were the mild cases of the disease, which ultimately too often prove fatal, which I have met with in my numerous tours in the Terri Ghurwâl, and Jounsár Bewâr during the past seventeen years carefully investigated, they would be traced to the children of some slightly leprous parents, whom it was hoped would be the rare exceptions to the disease hereditarily, anxiously hoped for, but rarely met with. I have been led to make these remarks, as it is hard for an institution like that at Dehra, which owes its existence to the exertions of Dr. McLaren, and the sympathy and liberality of the community of Dehra, to have it on record in its last report dated 15th of May, 1881, that 'it is supported entirely from *private* sources.'

"After a lengthened and varied experience during my Indian service, when I have superintended institutions for the daily gratuitous distribution of cooked rice in Orissa, to what all can witness on the road side here, the gratuitous distribution of drinking water to thirsty passers by, I feel I have met with no institution which more powerfully claims public support than the Leper Asylum at Dehra. No visitors

to Mussoorie or Landour should forget this asylum; as it is its presence at Dehra which enables the Municipality of Mussoorie, and the military authorities at Landour to rigidly carry out, in a manner I have not met with in any other Municipality or Cantonment in my Circle, the regulations regarding these poor creatures begging on the road sides. If ever suffering humanity claimed, by the highest of all claims, the protection and support of a Christian Government, the poor leper of the Ganges Doab from Gungootree and Jamnootree to Pryâg or Allahabad, can surely advance his claim in a manner which will leave no room for refusal; and I am confident that if the matter were properly laid before the Government of this country they would, from the revenues of the land, make some provision, and grant some allowance for the relief and support of these poor sufferers, whose very disease separates them from their fellow men, leading them now, as of old, to form communities by bonds of similarity in suffering, and thus to be the perpetuators of their diseased condition, and whose burden on the State may, without exaggeration, be called a divinely imposed one. I feel that something must be done, and as Deputy Sanitary Commissioner of the Circle, I feel it to be my duty to bring this subject most prominently to the notice of Government, as during my visit I could see money would soon be required for repairs, and if the income raised entirely from *private* sources, and devoted to the support of these poor creatures, already of itself far short of meeting the annual outlay, is too largely drawn on for such expenses as annual repairs, it must in the end lead to a curtailment of the benefits of the institution, and finally to its ultimate closure; and then the consequent dissemination of this distressing disease throughout these districts. Let any one examine the cash account of the Dehra Dhoon and Mussoorie Leper Asylum from 15th May, 1880, to 30th April, 1881, and I challenge them to show any institution which can exhibit either such a noble instance of local sympathy and liberality, in a locality not noted for its wealth, or such results for such a small outlay. A daily average number of

nearly sixty-nine helpless lepers kept in comfort, all charges included, for a sum less than three rupees (about five shillings) a month, and prevented from being a further scourge to society, is, in a district which has to a considerable extent to supplement its food supply by importation, an instance of careful supervision, which might be copied with advantage by many charitable institutions in this country. The known character for sympathy and liberality which Her Majesty's Government in this country has so long and so justly enjoyed, must suffer injury if the Dehra Leper Asylum has either to curtail its benefits, or close its doors altogether, from the local pecuniary support being unable to meet the annual expenditure required by the institution, or to accept the burden of it as a permanent claim on the sympathy and liberality of the Dehra Dhoon and Mussoorie."

In the following year 1881-82, the following is the extract from my annual report:

"In conclusion, I would again draw attention to the Leper Asylum at Dehra; on my last inspection I could see at once that unless the Government came to the help of this institution its very existence would be imperilled, while already its usefulness must be reduced. I would most respectfully beg to point out that, in my opinion, the matter is not a Provincial but an Imperial burden for the following reasons: Lepers are collected in this asylum *from all parts of the country*, many for safety as regards life!! and some for freedom from what they view, wrongly of course, as an endless oppression by the town and district police, who have orders to keep them from begging, and soliciting help by the exposure of their maimed and rotting limbs. I trust, therefore, I may not plead again in vain for what I cannot but view as a divinely imposed burden on the ruling power, that takes the revenue of the land. The native rulers in the past put these miserable lepers out of the way in various but sure methods, and it seems hard that the public of the Dehra Dhoon and Mussoorie should have to pay for the entire support of this Leper Asylum, as the only means of

obtaining immunity from witnessing, what in all ages have called for and secured State sympathy and support."

The mode employed to *remove* these lepers in Terri Ghurwâl, in the Himalayahs, was to entice them out by various means, and then push them over precipices into the torrent below. In Central India, these poor creatures were half buried in the erect posture, and the end hastened in various ways, and, since writing this paper, a friend has told me of a very suspicious case in the Bombay Presidency, which occurred lately, in which a poor leper was the intended victim. We need not therefore be surprised at these poor creatures fleeing from their own country, and taking refuge in the Asylum at Dehra, or for mutual protection forming themselves into bands. The present ruler of of Tirri Ghurwâl, who pays out of his own private purse the entire expenses of vaccination in his territories, and supports the Dehra Leper Asylum very liberally, is the last person to think of injuring these poor creatures; but I fancy there is also some fear from the family circle, as a leper relation is kept in the background, and can thus be removed without attracting much notice. This treatment of an incurable disease need not surprise those who have studied the subject, as handed down by old records; and I heard a gamekeeper in the south of Scotland, tell the case of a shepherd on Ettrick Water, who was smothered in his bed, when the symptoms of hydrophobia appeared. The gamekeeper had known the man who was thus treated, and, from the way he alluded to it, this seemed the treatment for hydrophobia, sixty or seventy years ago in the south of Scotland, an interesting fact for M. Pasteur to know.

Before leaving India last year, I wrote, what I might term a final appeal for the Leper Asylum, of which the following is an extract from my report for 1882-3:

"In again drawing attention to this subject (the Leper Asylum), I do so under the firm conviction, that unless something is done for this most deserving of institutions, to place it on a firm and permanent footing, it must be closed, and these poor creatures thrown out on the world to live a

life of hide-and-seek with the police, and to propagate the disease; and I trust if the Government feel unable to help the institution, they will allow me to plead for it among the natives of India and the European residents, who most certainly enjoy a great relief from being spared the compulsory view of these poor creatures, whose sufferings and deformities were till lately, exposed, as I have said, to the compulsory view of all travelling on the various routes to the hills, with, as I have little doubt, far from harmless consequences; indeed, in one case that I know of, with the most distressing subsequent results, which I need not allude to in detail here. It may be here stated, and I have had during the past nineteen years opportunities of forming an opinion on the subject, as met with in the Himalayahs, such as few possess or could acquire, that unless some steps are taken the disease of leprosy will become very common; as, in my own experience in the Himalayahs, I have reason to believe, from what I have seen and heard, that the disease will soon show signs of being on the increase, as the benefits of the Leper Asylum cannot be apparent yet. The cause of this increase is simple enough, viz., that the summary treatment of olden times effectually prevented the increase of leprosy, by putting to death in various ways those on whom the disease appeared before there was much chance of its being propagated; and as this practice is now forbidden by the British Government, in the absence of asylums such as that at Dehra, every facility is given for the propagation of the disease!! I therefore here repeat, what I have remarked yearly, viz., that the only way to prevent this spread of the disease, for a Government which has scruples in acting as its predecessors did for the public good, is to support and endow for the present such asylums as that at Dehra, which, while keeping these poor creatures in what to them is real comfort, most effectually prevents the disease spreading. I repeat, the case of these afflicted creatures is a divinely imposed burden on the ruling power, and when that is a Christian power, it loudly calls for help from a Government which has ever been known as one,

which, in the item of charity, used never to be charged with niggardliness; and I am confident if His Excellency the Viceroy came to know of the crying want of these poor lepers, whose only plaint is for some little peace and comfort in which to close their miserable existence, he would, as the representative of Her Most Gracious Majesty, inaugurate some measure, which, in the first place, would relieve the sufferings of these poor creatures, and without doubt finally lead in time to the gradual, and it is to be hoped, complete extinction of this loathsome disease. This must be my plea for thus earnestly pleading for these poor sufferers, and I do trust I shall not again plead in vain."

And now I have told my tale, and can only hope that the outcome of this effort for the lepers of India may be such, that a substantial and permanent benefit may accrue to these poor people suffering from no fault of their own, and that this effort may be associated with this truly International Health Exhibition, and its President H.R.H. the Prince of Wales, in remembrance of His Highness's visit to India.

DISCUSSION.

The CHAIRMAN, in inviting discussion on this interesting paper, asked if Dr. Bolton Corney could say whether leprosy existed at all in the Fiji Islands. That was comparatively a new country, containing a simple, sober, well-behaved people now beginning to be semi-civilised. They had only been lately visited by Europeans, but amongst them there had since been developed outbreaks of measles which had been frightfully destructive, no less than 50,000 having died in one epidemic.

Dr. CORNEY said he knew leprosy did exist in the Fiji Islands, but to a very limited extent. During eight years' residence there he had not seen more than three cases.

though he heard of ten or twelve more which were well authenticated. He believed in the surrounding islands, such as the New Hebrides, Solomon Islands, the Tongan group, and Samoan Islands, it also existed. The natives themselves recognised the nature of the disease, and as in all other countries where it existed practised an imperfect form of isolation. Whether this was due to a belief in the contagiousness of the disease, or whether it was simply that those suffering from it were repulsive in appearance he could not say; but, although the Fijians in former days might have been charged with want of humanity, to a large degree being cannibals, he did not think they ever practised the habit which Dr. Pringle had mentioned, of making away with the unfortunate lepers; they simply isolated them, and practised a form of treatment. There were certain recognised drugs chiefly, if not all, of a vegetable character, which they used in these cases, and there were certain persons who were noted for their more or less successful treatment of these cases.

The CHAIRMAN said that in very old times in England lepers were distinguished especially by a very raucous voice; it had been noticed in India that the epiglottis was especially apt to be affected, and this hoarseness was frequently present. Again, in Lower Bengal, however little leprous the individual might be, there was always a thickening of the lobe of the ear. This was pointed out to him by Dr. Webb, when he first went to India, and in a great number of cases he never knew that test fail. It was a remarkable thing that, in Auvergne, there used to be a large body of people who were known as cagots, who were probably either lepers or the descendants of lepers, who had been transferred to that volcanic district, and it was noticed of them that they had no lobes to their ears. It appeared as if, in the course of time, the lobe of the ear having been diseased in the ancestor had disappeared in his remote descendants.

Surgeon-General BALFOUR said that, when cannibalism prevailed in the Fiji Islands, it had been noticed that

the people would not touch the cannibal food with their hands, because they believed that so doing would produce leprosy, and they always used a long skewer made of particular kinds of wood, usually from the *Casuarina equisetifolia* and the *Afzetia bijuga*. He might mention in connection with the views Dr. Pringle had brought forward about leprosy being hereditary, that he had certainly known one case where, so far as they saw, it could not be hereditary, though of course such points could not always be traced. This was the case of a gentleman who rose to the head of the Madras Medical Department, and who died from leprosy. It came on him after he had been about fifteen years in the service. He was a native of Ireland, and he did not know how it could have been hereditary; but in that instance there was no doubt of its being tubercular leprosy. He knew of another case of a young lad who died of leprosy; he, too, was of pure parents, so far as was known, and there was nothing to indicate the hereditary nature of the disease. With regard to its possible cure, he had known a very great improvement take place, especially in one case, where a Hindoo had been put away from his family, but became so much improved that he was reinstated. Dr. Bhau Daji became very celebrated for his treatment of leprosy, but he or his brother kept the remedy secret, and his brother having been stricken down by paralysis, the remedy was never made known, but it had, no doubt, consisted to a great extent of chaulmoogra oil, from the *Gynocardia odorata*, and also, undoubtedly, Gurjan oil, from a species of Dipterocarpus. This latter oil was put forward as a perfect cure for leprosy by a medical man who had been sometime in the Andaman Islands. When that officer came to Madras, where there was a very large leper asylum, he (Dr. Balfour) asked him to try Gurjan oil there, and undoubtedly the skin was acted upon, and a great improvement was effected, but there was no cure so far as could be seen. Dr. Bhau Daji was certainly very successful in his treatment, but he was very strict with regard to diet, cleanliness, and all other

things which bore upon health. He did not know how many leper asylums there were in Calcutta, Bombay and other large cities south of the Nerbudda, but there were several large asylums in the towns of the Madras Presidency.

Dr. HAYWARD said he had never been in India, but he was much interested in leprosy, and as it was now said that the bacillus of leprosy had been recognised, he should like to inquire of Dr. Pringle if he was quite satisfied that leprosy was communicable, at any rate, by the bacillus, and if so if it ever assumed an epidemic form?

Surgeon-General MANIFOLD said he was stationed some years ago at Rangoon, and he had seen the Gurjan oil tried there with considerable good effect. He had also been at the Andaman Islands for a short time, where also it was used, and he believed it was first introduced there, and the patients, although not cured, seemed to derive considerable benefit from it. Another thing which struck him was noticing, at the pagoda at Rangoon, that the poor lepers were constantly going up and down the steps, and they seemed to be held in great reverence by the Burmese. They spoke to them familiarly, and supplied them with rice and other necessaries, so that they seemed to have not the least fear of the disease being at all contagious.

Dr. WILSON asked at what period of life this disease showed itself in the child? He had always been told that the children were born healthy, and it did not break out till the fifth or sixth year, sometimes not till the fourteenth or fifteenth. It would be interesting to know whether it ever arose without being hereditary. He had enquired particularly on this point from lepers themselves, and they mostly denied it, though occasionally it was admitted. The officer in charge of the lepers' asylum at Calcutta told him that the children were born healthy, and that it did not break out till the fifth or sixth year. He did not believe it was infectious; but there were two kinds of leprosy, the one commonly called tubercular was generally preceded by an acute attack, with a red appearance of the

skin, and then after some months the tubercular appearance on the face showed itself. One kind was called by the natives red leprosy, but that seemed to be the disease in its primary form ; afterwards it caused a thickness of the skin, and when the disease was farther advanced, it destroyed the fingers and toes, and the bones of the nose disappeared. (Dr. Wilson produced a series of drawings, which he had made in India, showing the different forms and stages of the disease.)

The CHAIRMAN said that he had never seen leprosy so faithfully represented on paper as it was in these drawings.

Surgeon-General BALFOUR said the Bombay Government took great interest in the cure of leprosy, and after the treatment of Dr. Bhau Daji's brother became so famous, the lepers were photographed before treatment commenced, and after they were pronounced cured. He had asked of the Madras Government permission to do the same, and if application were made to the Governments of Bombay and Madras, all those photographs would be supplied, which would prove very useful as showing what could be done and what could not be done in the way of amelioration.

The CHAIRMAN said that with regard to the epidemic character of this disease, he knew that Dr. Thomas Farquhar, who paid considerable attention to leprosy in India, considered that it very much depended on the eating of bad grain, and traced it in a great measure to bad seasons and to change in badly-stored grain. So far as it arose from these causes, it might be considered rather as endemic than epidemic, only that the endemics of India were so terribly extensive that it was often difficult to say whether a disease was endemic or epidemic, especially where a whole province was visited by famine or bad crops. With regard to the question of heredity, a great deal of information had been collected, and there was no doubt whatever that you often heard of the grandfather or grandmother of those suffering from it having been affected ; but then it must be recollected, with regard to this question, that the family all lived in the *same way* and it might not be that there was any sort of

contagion or heredity, but if they all ate bad grain and all lived in the same manner, and the same conditions prevailed, it might very well run in the family. As he had said on the previous day, this disease was extensively prevalent amongst people of all ranks in England from the time of the Crusades to that of James I.; and there were extensive buildings set apart for lepers, because our ancestors in the Middle Ages knew, as well as Dr. Pringle does, the necessity of secluding these people and of making them comfortable. Very few probably who passed St. James' Palace were aware of the origin of that place, but the fact was that, wherever you saw an ancient mediæval building in the United Kingdom called St. James's, it had been a leper asylum. The palace of St. James' was an asylum for leprous ladies of high rank. So, wherever in France or England you found a place designated Maison Dieu—for instance, the fine Gothic building at Dover, which he believed was now the town hall, though he recollected it thirty years ago quite away in the fields — was a leper asylum; so was the hospital at Paris bearing the same name. Here the lepers were secluded in a semi-religious way; and it was said that some mysterious side windows seen in mediæval churches were intended for lepers to hear the sermon through, seated in the churchyard without mixing with the rest of the people. Going back to the question of heredity, he found, on looking over an old bill of mortality in the 'Gentleman's Magazine,' about the year 1735, that, although leprosy had been pretty well stamped out of England at that time, three persons had died in London of leprosy during that year. Therefore it was impossible to say but that there might be still some little hereditary influence at work, as, for instance, in the case of the unfortunate medical officer which had been referred to, which was the only unquestionable case of a European suffering from the disease in India he ever recollected to have heard of. Next to seclusion, the most important remedy was ample diet In old times in England these sufferers were not only secluded but fed exceedingly well.

He had a record of the dietary of one of the large leper-houses, which was singularly ample and varied, particularly with regard to animal food. Those two things, seclusion and good food, were all that could be relied upon. He quite agreed that, essentially, there was no cure for leprosy, but still it might be improved by treatment. When he was in India he carried out treatment very systematically, having being desired to report upon more than one plan, so that he was thoroughly familiar with these cases. Although there was no cure for the leper, it must be borne in mind that there were two sorts of lepers; there was the unhealthy leper and the healthy leper, but the healthy leper was just as much a leper essentially as he was when in bad health. He knew very well those admirable photographs which had been referred to. Some of the most wretched beings, when well kept for about nine months, well fed, rubbed over with oil, and dosed with plenty of chaulmoogra oil, went out fat and smiling, but the disease still clung to them, and the physician would find distinct marks of leprosy quite unremoved. Still they were healthy, which was a very uncommon thing in other diseases. You did not find healthy persons with consumption. But they could only be kept healthy so long as they had good food and treatment; and it certainly struck him that the dietary of some of the Indian Asylums failed in not being sufficiently nourishing; the diet should be rich in animal food and milk and oleaginous material. The leper in India was generally a beggar; and, although the poor creature was sometimes in such a condition, as shown in those drawings, that the house of his life had almost tumbled to pieces, yet he suffered wonderfully little pain, and if he could get plenty of coppers by the roadside, he found it a remarkably good trade. Therefore, to break up the eleemosynary trade of the leper, it was necessary that asylums should be provided with good food and lodging to encourage these poor creatures to come in.

Dr. WILLIAM EWART said he wished to ask a question and to submit a case, the ætiology of which was rather

puzzling. Was the European population resident in India in any degree exposed to this disease, and if so in what degree, and under what circumstances? The case which he specially desired to submit had been under his treatment for several months in St. George's Hospital, and recently in the out-patient room. The patient was about 25 years of age. He was born in India of English parents, who left this country quite young, the father being about 18 and the mother 16, both from very healthy families. He had seen photographs of several members of their respective families; they looked strong and healthy, and somewhat refined. This young man was an engine-driver, and suffered the first symptoms of the disease about seven years ago. Special inquiry into the question of his diet, habits of life, and the extent to which he mixed with the natives, showed complete freedom from those influences which, as a rule, were put down as conducive to the generation of the disease. He had lived chiefly amongst Europeans, never intimately associating with the natives; had led a regular life as far as one could judge; and with respect to fish, which was sometimes credited in books with the power of generating this disease, if too freely used, he had always had a strong dislike, and had taken very little of it during the whole time he was in India. In other matters of food, Dr. Ewart could detect no peculiarities which would at all guide one as to the derivation of the complaint. But the patient had occasionally been reduced, during his railway trips, to use somewhat impure water. With regard to treatment, he might say that the man greatly improved during his stay in the hospital; he became healthier and stouter, under the administration of large doses of chaulmoogra oil, which he bore very well indeed, together with a liberal diet. Since he had become an outpatient, being somewhat reduced in means, he was going back, looking weaker and thinner, and it was feared the disease was making progress, for his sight and voice were suffering considerably. This was a case where no heredity could be traced; if it existed, it must have been of the nature of reverting heredity; and it must

have required a full generation of residence under the warm sun of India to quicken the bacillus into activity.

The CHAIRMAN said he had never seen a case of leprosy in a pure European, though there were plenty in the mixed races. He did once see a little boy who was waiting for another medical man, who had the appearance of an English boy, who had a very suspicious little finger which looked very much like leprosy, but he did not know the history of the case, and that was the only approach to it, in the European, which had come within his own experience. The case mentioned by Surgeon-General Balfour of the medical officer was the only unquestionable case of the kind which he had ever heard of.

Dr. PRINGLE said he was amply repaid for any little trouble he had taken in preparing the paper by the discussion which had taken place, and if the result was to enlist sympathy on behalf of the young man whose sad case had been mentioned by Dr. Ewart, they would not have met in vain. As members of the medical profession, their duty was to relieve their fellow creatures in every way they could. With regard to the question of contagion, it must be remembered that the first records of leprosy were biblical, and there it was connected with uncleanliness, and the fact of leprosy necessitating removal, and uncleanliness, and that anyone was accounted unclean who touched a leper, was the only way in which he could explain the belief of its being contagious. With regard to heredity, he might mention that Dr. Frimey had just written an excellent article in the 'British Medical Journal,' in which he gave a case of a patient named Greenland, whose father was a native of England, and his mother a native of Dublin. Greenland himself had never been out of the colony; the father had 14 children besides himself, and is still living, aged 78; his elder brother was 54, and within the last 18 months the father had shown decided symptoms of the same disease—leprosy. That showed clearly a case of heredity, which in other circumstances might have been very difficult to trace. Here it had cropped up many years

afterwards, but if it was anything else than hereditary it would not arise in isolated cases. In fact the instance of the poor medical officer proved the whole thing. The Chaulmoogra and Gurjan oils he believed were a benefit in this way, that oil of any kind in large quantities would supply what the patients' diet had for many years signally failed to give him. As a student in Edinburgh, Dr. Pringle remembered the late Sir James Simpson laying great stress on rubbing in oil in cases of delicacy; and when Dr. Pringle returned to Edinburgh after thirteen years in India, he told Sir James he could believe in his rubbing with oil, for with all his experience in India he never saw a thin tallee or seller of oil; the fact was, these men always wiped their hands on their bodies, and were thus constantly kept oiled, and through the pores the system drank in the oil, which was just what was wanted in leprosy. Still, this would not cure the disease. Then the question arose, if the disease were hereditary when did it appear? There were a number of cases in which a child had been healthy for such a length of time that all idea of leprosy had been passed over, and the child had grown to maturity and married, and then at 20 or 35 the disease had appeared. That was a terrible thing, and he could not at present see how it was to be checked. Some people objected to the expression stamping out the disease, but all he could say was that Sir James Simpson used it, and he was content humbly to follow him. Leprosy had been stamped out in England, and if it could be done here why not in India? There were two kinds of leprosy, one was the white leprosy. He remembered the Rajah of * * * who was a leper in many parts of his body, "as white as snow." He met him at the festival of Juggernaut, in 1857, and he offered him a lakh of rupees, £10,000, if he could cure him; but he told him, no, he could not cure him, but he could tell him something very comforting, namely, that the disease in his case was not such as would be likely to shorten life. That was in 1857, and he saw him again in 1877, at the Imperial Durbar at Delhi, looking remarkably

well. Amongst some of the higher Rajpoot families this white leprosy was hereditary, and, in some villages in the north of India, there were whole families of Albinos, this condition descending regularly from father to son. With regard to what should be done, these poor creatures were driven to beg unless otherwise provided for. As the chairman had remarked, there was not much pain in the disease, and if they could only give them a little comfort you soon brought something like brightness to their faces. As far as his experience went, the European population in India was quite exempt, but directly you got to the Eurasian it was quite different, because there you got some touch of heredity. He could not say that eating fish predisposed to it, because leprosy was very bad in the hills, where fish was very scarce indeed. In conclusion, he would say that he hoped something might be done for the poor engine driver whose case was described, which would give the discussion a practical turn.

The CHAIRMAN said that Mr. Jonathan Hutchinson some time ago held very much to the opinion that fish, or bad fish was a cause of leprosy; he would not say whether bad fish of any kind was a cause of leprosy, but undoubtedly, as Dr. Pringle had said, there was an enormous amount of leprosy in India in districts where there was scarcely any fish, or where the people did not eat fish at all. There was a great heal of leprosy among people whose caste opinions prevented them from eating fish, and therefore, to put leprosy down to fish eating as you would put ergotism down to the eating of spurred rye, was undoubtedly a mistake, although, no doubt, eating nasty fish might make people unhealthy.

THE BEHAVIOUR OF TYPHUS FEVER DURING THE PRESENT CENTURY.

The CHAIRMAN: There is only a short time for discussing the second subject, although it is full of interest. In an early announcement it was stated that we were to have a paper at this time on floating hospitals, but unfortunately the gentleman who was to read the paper has had trouble in his family, and has been unable to come forward. There appeared to be a blank in the programme, and therefore I took up this subject, viz., the behaviour of typhus fever during the present century, and I will simply lay the question before you for discussion.

I think it may be said that there was no plague in England after 1665. It is agreed by most authorities that the plague was typhus—that is to say, it was bubonic typhus, a very marked type of typhus. After 1665, it, as I say, departed from these shores, but what remained? Typhus, its representative, a disease of similar type—not, perhaps, its brother, but its cousin—a disease cognate to the true bubonic plague. In the old bills of mortality typhus was known by the designation of malignant fever, spotted fever, and purples. This meant the maculated typhus, such as I saw very prevalent in London—a most hideous epidemic of it in the year 1836 or 1837—a disease of the utmost malignity, the whole body being covered with purple maculæ, very characteristic indeed—the mulberry rash—and the patient generally dying from that which I have never seen at another time, masses of deposit—we called it typhus deposit—occurring in a lobulated form in the lungs; patients would die almost suffocated from this characteristic deposit. Sir James Paget has lately discovered amongst the preparations made by John Hunter in the Hunterian Museum, a specimen of small intestine, bearing unmistakably the typical specific ulceration of enteric fever. Hunter found, or was presented

with, that type-specimen, and he died in 1793. Consequently the true enteric fever of Jenner existed in London, at least, in 1793. That which is now called dothienenterite, and which was first called dothinenterite, was perfectly well known and very prevalent on the continent of Europe, especially in France, before it was recognised by any high authority in England, that is to say, about the year 1818 or 1820. Richard Bright, who was an admirable observer, first noticed and described in Guy's Hospital Reports, with most characteristic and beautiful plates, that form of fever which he saw in London late in the season of 1826. I have no doubt that every medical man present knows those plates and that paper, but anyone who reads that paper and sees the plates will say, "here is the enteric fever of Jenner." That disease was, I am sure, uncommon in London ten years after 1826, when I first began to observe disease, namely, about 1836. Now see how these diseases have behaved in England of late years; the prevailing fever which attacked rich and poor (for many rich people died of it) was the common typhus fever of London in the year 1835, but how is it now? I just got at random, some time ago, the statistics, for a few years, of some London hospitals. Taking St. Bartholomew's, in 1875, I found they had one man suffering from typhus, three women, and one death. They had 32 cases of enteric fever in men, 14 in women, and three deaths. Then, taking Middlesex Hospital, in 1874, in that large hospital there were two men, four women, and one death from typhus, whilst of enteric fever there were 20 cases of men, 18 of women, and five deaths. The outcome of ten years is that there were in these hospitals—I have here the London Hospital, Charing Cross, and others, and their fever statistics are very similar—39 typhus cases, and 419 cases of enteric fever. Now, I am perfectly certain that in the year 1835 you would probably have had upwards of 1000 typhus cases, and perhaps not more than 20 or 30 enteric cases, which Richard Bright used to term "typhus with bowel complication." He did not call it enteric fever or typhoid. I do not see my friend Dr. Dickson here, but he

mentioned to me a very interesting fact which shows the behaviour of typhus and enteric fever in these islands. In Edinburgh it was notorious that, in the old town, there was a vast amount of typhus. That was the prevailing fever of old Edinburgh, but in some buildings, built in a palatial style with modern improvements in the New Town, cases of enteric fever began to appear almost immediately the houses were occupied. This is a very noteworthy fact in the natural history of the behaviour of typhus and typhoid. The remarks of Dr. Squire and Mr. Armstrong yesterday very much hinged upon this important question of the behaviour of typhus. Dr. Squire used a very ingenious argument, but one in which I quite disagree with him. When I quoted the authority of a very able general practitioner, whose experience in London commenced about 70 or 80 years ago, and who said, 40 years ago, "you cannot bleed your typhus cases now, but you could bleed your typhus cases 30 years ago, and you had to bleed them or they would not recover." Dr. Squire seemed to think that those cases in which you could bleed might have been mistaken, that they might perhaps have been cases of pleurisy or meningitis. I cannot agree to that at all. There is no physician living who could distinguish a case of pleurisy or one of meningitis from one of typhus more clearly than Dr. Greenwood could do. As we get old we learn; I know that all my egregious mistakes in diagnosis have always remained and rankled in my mind, but I have had the melancholy satisfaction, at all events, of having been able to set myself right. Dr. Greenwood was a perfectly unquestionable authority, and he had seen a typhus in which you could bleed, and he also lived into the time of that typhus in which you could not bleed. There is one point which was rather touched upon by Mr. Armstrong. When you got a case of Indian paludal remittent fever, it is as like a case of typhus as anything a physician can see. We know that we can determine precisely what it is by the quinine test. You cannot well give, in a case of paludal remittent fever, too much quinine; and, though it looks like typhus, unless

the man be in an utterly hopeless state, you have hopes of cutting short the disease by quinine, but you cannot cut short typhus. No man was ever *cured* of typhus. The physician may, like the pilot, watch him and guide him through the attack, but there is no cure. There is one question on which we cannot quite expect to agree, and on which I stand here as a heretic. My belief distinctly is that *Typhus and Enteric Fever are epidemic diseases.* With regard to enteric fever, why is that, just at the very same time so many hundred miles apart, the troops in Egypt and the inhabitants of Paris suffered from exceptionally severe outbreaks of enteric fever? I know that the minds of nearly all medical men have resolved very distinctly that enteric fever is generated by something that comes out of gutters or sewers; my belief is that an atmospheric wave, carrying the epidemic influence, predisposes to the disease, of which the drinking of impure water is an exciting cause, just as those who drink impure water in Calcutta are especially prone to be attacked with cholera at the cholera season. I think that, if I had time, I could make out a very good bill in favour of the opinion that typhus fever is truly an epidemic which comes in a wave over the country, and that it is not generated in badly ventilated dwellings. The Dwellings Improvement Act may have mitigated its severity in a very great measure, but that Act, I believe, has not removed the influence. It is said that the Fire of London prevented the recurrence of plague—the great typhus—in our Metropolis. I do not believe that for a moment, I think with others, that the plague wave has never again come in this direction, but that, if it did, London would suffer nearly as heavy a mortality as it did in the year 1665. There are now years in which typhus is especially rife in London in its small way; there is distinctly an outbreak of typhus, and that is the appearance, as I believe, of the epidemic or endemic, whichever you please to call it. I fully believe that, sanitate as you will, some of the youngest among you may have the misfortune of living to see a year in which London will be visited by true typhus as severely as it was

in the year 1836 or 1837. This, however, I must admit is theory; and it is, in the present day, a very heretical theory.

Surgeon-Major PRINGLE said with reference to what the Chairman had observed about the plague wandering about India from Juggernaut up to Hurdwar, and to Thibet, he had seen a variety of this disease, namely the Mahamari or great sickness; it was the true plague of the Himalayas. It was the result of the grossest long continuance of the violation of everything sanitary. He remembered a remarkable incident, which might account for the old saying of rats leave a sinking ship. Some years ago he was with another officer deputed to inspect a locality where this plague had broken out. On going to the village they found that all the roofs were taken off the houses, and the villagers were all under the trees on the hill side. They found that three or four people had died who were left in the huts, and, on inquiring who pulled the roofs off the houses, they were told that the bears did that to get at the rice stored in the roof. On asking why they left their houses, they said because they saw the rats leaving; and it appeared to be the fact that, on the first approach of plague, the rats would leave the village, and thus gave notice to the people, then the bears came in and helped themselves to the stores of rice, as he had stated. That was the true bubonic plague which the Chairman had alluded to. It was stamped out by cleanliness, by allowing human beings a little more air, and turning the cows out of the huts. He remembered once going into a village where he found something like severe typhus. His object was to introduce vaccination; and, on the people coming out and asking him to cure this disease, he told them that he wanted to establish vaccination, and that if they would promise to bring all the children to be vaccinated, he would do what he could to remove the disease. He found the huts all shut up, the cows living underneath, and the men up above; a wall was built all round, so as to keep all the cold fresh pure air out, which of course kept all the bad air in. He had this pulled down,

he opened up the whole place, turned out the cows, and then gave some medicine, but he had far more confidence in pure air, the pure air of the hill side, than in the medicine. Happily they all recovered, and he had no difficulty about vaccination. That disease was entirely produced by the horrible state in which they lived. Dr. Pearson once treated an extensive outbreak much in the same way, and he would be always remembered there as the man who drove the cows into the jungle and got rid of the sickness.

The CHAIRMAN said he did not fully agree with Dr. Pringle. True the disease was incident upon filthy houses, but Mahamari was a great and very widely-spread epidemic. He thought he had proved this by the facts put together in a paper which he wrote on that plague. The disease seemed to have originated in a place called Pali, at a time when epidemic influence was peculiarly rife, and it raged over an immense district right away to Gharwal and the sub-Himalayan districts. It then showed itself in various other parts of India. Mr. Chadwick holds that the incidence of an epidemic is always upon the nastiest places. Wherever there was bad water or imperfect ventilation, or an ill sanitary condition, there the scourge would fall the heaviest, and no doubt the Mahamari especially fell most severely on those cow-filled houses, and no doubt Dr. Pearson and others stamped it out for the time being, but it returned again. As with nature, if you thrust her out with a fork she would always return, so with these epidemics. He contended, in opposition to Dr. Pringle's opinion, that the mischief was epidemic, that it swept in a wave over thousands of miles of country, though its incidence was most noticeable on these insanitary spots.

Surgeon-Major PRINGLE said no one could object to the statement that this wave went over large tracts, and had its incidence on unsanitary spots, the question was what was the incidence, was it brought down from the clouds as Franklin brought down the lightning? There were some districts where the Mahamari never occurred. Of course if

it were a large cloud floating over the country, and every unsanitary spot acted like Franklin's kite and brought it down it was thoroughly explained. The conclusion he drew was that they must have no unsanitary spots, and then the cloud or influence would remain aloof.

Mr. ARMSTRONG did not believe in the wave theory, he rather gave in his adhesion to Dr. Pringle's statement, but not quite to the modified form in which he had last put it. If they regarded the spread of disease as a "crop" as of grain, he thought it would be nearer the mark. In certain years and certain places there were much better crops of corn than in others, and epidemics of disease were very much the same. He believed the crop theory would explain everything which was to be explained as regarded epidemics. There was another reason for adopting this phrase, namely, that they believed the disease came from seeds or germs, as in the case of other crops. The weather influenced crops of corn, and it influenced the crop of disease. Warmth, moisture, and other meteorological conditions would help the development of grain in the same way as they might help the development of disease germs. He agreed with the Chairman's observation with regard to the plague and typhus. He had had considerable experience of the treatment of typhus at the Newcastle Fever Hospital and Dispensary, and had met with cases of typhus in certain years where there was a considerable enlargement and the formation of abscesses in the parotid and inguinal glands. These cases forcibly brought to mind the descriptions of the plague which he had read. He could understand how in typhus epidemics the disease under peculiarly unfavourable local circumstances, that is to say, depression on the part of the individual or bad sanitary surroundings, might easily revert in type to the plague which the Chairman foretold, but which Heaven forefend, might yet visit London. He hoped they would never see it, and if sanitary improvements, the prevention of overcrowding, and other sanitary measures were maintained as they were

now being carried out, he believed we never would be visited with anything like the epidemics we have had in the past. Dr. Roberts, of Manchester, in an interesting paper read before the British Medical Association, in 1877, described aptly the change of type by an illustration from the vegetable kingdom, called by horticulturists sporting, which meant the faculty in plants of departing from the original type, and after a time reverting to it. Dr. Roberts explained many varieties and apparent changes of type in disease in this way. In former times there must have been very different appearances in measles, since it was often confounded with small-pox, whereas the merest tyro nowadays could never mistake one for the other. He was glad to hear the Chairman state so positively that you could not cure typhus, for that phrase was often used, though it was very unscientific. Typhus was never cured, it always ran its course, and no treatment ever applied to it cut it short for one day. Want and distress were said to be great predisposing causes of typhus, but in the great distress which existed in the northern counties, three or four years ago, he had observed a remarkable immunity from typhus during a hard winter, when the poor suffered from overcrowding and from want of food. With regard to typhus, he had put together a few facts showing its prevalence in Newcastle from 1778 to 1877. In the early years the two diseases were not distinguished. From 1778 to 1789 there were twelve years of continued outbreak, doubtless chiefly typhus; then two years when it was much lighter. Then, from 1791 to 1796, six years of epidemic, followed by three years lighter. From 1800 to 1804, four years of severe outbreak, followed by twelve years with very little of the disease. From 1817 to 1819, inclusive, for three years there was a great outbreak, followed by five years lighter. From 1825 to 1848 there were twenty-four years of continued and severe outbreak, especially during the last eleven, followed by two years' pause. In 1851 and 1852 there were two years' increase,

followed by three years' pause. From 1856 to 1864 there were nine years' increase, followed by one year's pause. In 1866 there was one year's increase, followed by four years much lighter. From 1871 to 1877—the period which concluded the century—there were seven years of slight increase, the highest year being 1873-74. Afterwards the fever decreased gradually. Since that time there had been little or no typhus. He would have gone more into statistics, but was deterred by the fact that it was not quite clear what was included in the term typhus in the returns. Any deductions based on a possible error of diagnosis had better be omitted. He regretted that students of medicine were not systematically taught fevers, as they ought to be. There were difficulties and dangers in their acquiring this knowledge, but one result of the present system of medical education in England was that young men came into dispensary or parochial practice who had not learnt fever, and, unfortunately, they had to acquire a knowledge of the disease, sometimes at the expense of themselves, and often at a considerable expense to the public. He had repeatedly seen outbreaks of fever arising from a single unrecognised case, which, if that case had been promptly dealt with, would have been prevented. For instance, a young practitioner failed to recognise a first case, and certified it as meningitis, or pneumonia, when it was unmistakably typhus; consequently no protective measures were taken and an outbreak was the result. This kind of thing had been brought before his mind very often. He had repeatedly noticed outbreaks at Newcastle, which had extended widely, arising from mistakes in diagnosis at the beginning, but for which the disease would not have spread. There were certain fallacies with regard to epidemics. The spread of typhus is chiefly owing to faults of isolation, for if the sick person is promptly isolated the disease may be limited; at the same time epidemics are like crops, and you will not have a crop unless the seed is sown. During the last ten years there has been great activity shown in Newcastle with regard to typhus. There are facilities

for getting information, and for several years past, on the first information of a case of typhus the Health Department is in motion, and every means are taken to get the patient to hospital. This has been carried on systematically for the last ten years with the most satisfactory results. Another point limiting the spread of epidemics is the fact of unsusceptibility of a population. In certain districts in Newcastle, which used to be notorious fever-dens, there were a few years ago remarkable exemptions when the disease visited adjoining districts; but, as he happened to know, that immunity merely arose from the fact that nearly every person there had had an attack of fever before. The Chairman had raised the question as to why typhus was more prevalent at special seasons, particularly in the winter. He thought it was due to two things, first, the depressing effect of cold, which made people more liable to catch infectious disease; and also to the fact that the cold weather led to the closing of windows and a greater absence of ventilation. The question had been raised, had the type of fever actually been changed? Evidence had been brought forward by Dr. Squire to show that the type of small-pox had undergone a change; and he thought possibly if they could examine typhus as readily by the eye as they could small-pox, they would find something of the same kind. But there were not the same means of recognising minute changes. Again, they had not the means of measuring the actual amount of fever in past times as was done at present. In former days the temperature was not taken by the thermometer, and therefore they could not compare the actual temperature of present cases with those of the past. In the same way with regard to delirium, prostration, bed-sores, tedious convalescence, and so on, in typhus, they had no actual means of comparing the past with the present. Then there was the question—assuming that the present form of disease was the old bubonic plague, under a milder form—how far that improvement was due to sanitation or other causes outside of the disease itself. He was inclined to think

it was due to the better condition of the individual and his surroundings, more, perhaps, than to an alteration in the disease itself. With regard to treatment and its effect on the rates of mortality, typhus was not treated as it was formerly. He did not suppose the Chairman would attach much importance to treatment, because in a general way it might be said there was no specific cure for it. You must treat the symptoms as they arose, and endeavour to support the patient, and help him to swim through the disease, but you need never look to turning him back. He had some reason to believe that the delirium of typhus had in the last twenty years become milder. In former times he had often violent cases to deal with, where the patients had to be forcibly restrained, and even treated with antimony and depressing agents, but he had not had such cases certainly within the last five years. On the contrary, he gave wine, ammonia and stimulants in small doses, and observed some care to give them opportunely. Cases of typhus were not of late years so violent as they were formerly.

The CHAIRMAN said, in replying, that he should merely say a few words regarding what had fallen from Mr. Armstrong, to whom they were very much indebted for the good work he had done on this occasion. With regard to the parotid suppuration which made typhus somewhat similar to bubonic plague, he saw it very distinctly in several cases at Guy's Hospital nearly forty years ago, and he saw it in many cases of what he believed to be paludal remittent fever in Calcutta. He believed the patients generally did ill. He had not seen in those cases any evidence that the disease approached the conditions of bubonic plague. Undoubtedly Dr. Armstrong was not likely to fall into the mistake of confounding typhus with pneumonia, but the average working medical man, if he had some of those cases of true typhus which proved fatal by pneumonic complication, might very easily consider that there had been an outbreak of ordinary pneumonia. Indeed, these

patients did really die of pneumonia, but the disease was typhus, not with an intestinal complication, or with a cerebral complication, but with a pulmonary complication, such as has been known to occur in England of late years. There was one point which he should very much like to have time to argue out with Mr. Armstrong. That gentleman gave a history of these fevers, and very valuable data his were; this question was now coming up again, and its data ought to be all clearly drawn out and stated in print. It had been shown that, in what he supposed must have been the back slums of Newcastle in the last century, poor degraded badly fed people died in wretched hovels, in some years of typhus; but then there would be eight or ten years in which there would be no typhus. Now was there not evidence of endemic influence here? Did not the miserable houses remain, did not the habits of the people continue the same; why did these intervals occur? His reply was, because the wave did not visit the town. With regard to the cloud or Pandemic wave doctrine, they knew that, in London, the clouds were full of what were called 'smuts'; the waves of the sea were full of luminous infusoria and many other active lives, but he thought such philosophic reasoners on epidemics as Dr. Lawson and others would quite admit that the Pandemic wave might be filled with bacilli or other microzymes, but they contended that this influence moved or arose from time to time, under laws which were still nearly inscrutable, as nature or rather Providence willed. Did those poor people in Newcastle, during the last century, become rich in the good years, did they get better food, were their houses improved? He felt assured that their houses and their general condition were not improved. When a great typhus outbreak occurred formerly in London, it did not lead to any extensive sanitary measures for the improvement of gutters or of badly-ventilated buildings. It was, as Mr. Armstrong described, if you went into a servant's room at almost any season, especially in the winter time,

the fireplace and the chimney were blocked up, and every crevice in a door or window was closely stuffed with paper.

(The Conference then adjourned for luncheon.)

(The chair was resumed at half past two.)

REMARKS ON THE ASPECTS OF CHOLERA IN EUROPE AND ELSEWHERE.

By ROBERT LAWSON,

Inspector-General of Hospitals, late President Epidemiological Society, Fellow of Statistical Society.

THE recent outbreak of cholera in the south of France, though not altogether unanticipated, has caused a great degree of excitement, has given rise to a striking difference of diagnosis, and has called forth a variety of hypotheses as to its mode of origin which, though they may appear to be in harmony with some points in its history, still fail to embrace all those presented during the course of an epidemic of this disease. An examination of these questions at the present time cannot fail to be interesting, and it may even be useful, by showing the insufficiency of the conclusions commonly arrived at, and by directing attention to some peculiarities manifested during epidemics which have been much neglected hitherto.

The course of previous epidemics of cholera led epidemiologists to fear that the outbreak in Egypt in 1883 might be followed by its extension to Europe in the present year, but they could neither state this with certainty, nor indicate the exact point where the disease would manifest itself; and even now, while it is prevailing at Toulon and Marseilles, no one can predict whether it may not spring up at other points of the Mediterranean coast as the summer advances, or what course it may pursue in

France itself. In the outbreak of 1849 cholera was epidemic in fifty-seven of the eighty-six departments then in France; in that of 1854 it was epidemic in seventy; and in that of 1865–66 it affected fourteen only with sufficient severity to be considered epidemic. Of the eighty-six departments twelve have suffered in every one of the four great epidemics, and nine have never been affected.

Cholera is met with in two forms, that of the simple summer cholera, or cholera nostras, characterised by the evacuations being more or less bilious, and its amenability to treatment; and the so-called Asiatic, or malignant cholera, in which the evacuations resemble rice-water, and there is great collapse, with blueness of surface, alteration of voice, and suppression of urine, and very great mortality under every mode of treatment hitherto employed. Malignant cholera usually appears as an invading epidemic, and extends over large portions of the world in successive years; but, since its first appearance in Europe in 1830, there have been nearly every year single cases appearing sporadically, or even small groups of cases, which present every symptom of the malignant form of the disease, and which, had they occurred during an epidemic, would have been acknowledged as typical instances of it. The relation of such cases to those in an epidemic is obviously a point of the highest importance to determine, but hitherto epidemiologists have not arrived at a common agreement upon it. Those who believe cholera is propagated from man to man regard the sporadic cases as altogether different in their nature from those occurring during an epidemic, as they cannot affiliate them to a previous case, and in most instances they are not followed by others, or, as commonly described, "do not spread." As the transmission of cholera from man to man is a moot point between the different schools of epidemiologists, it is incumbent on those who support it to adduce some more trustworthy evidence of the difference between the sporadic cases in question and those occurring during an epidemic than the statements just referred to, if they desire to convince others of the correctness of their own views.

The necessity for greater precision in this question is strikingly illustrated by the proceedings in France in connection with the recent appearance of cholera at Toulon. The medical officers on the spot, judging from the clinical features of the disease before them, concluded it was malignant cholera, and others of high position, sent from Paris to report on it, after a careful examination of the sick, confirmed their opinion, though they were unable to indicate either the source from which the infection came, or the means by which it was conveyed. On the other hand, M. Fauvel, a man of great reputation, and who stands high as an epidemiologist, stoutly maintained that the disease at Toulon was cholera nostras only, and that it would soon disappear, and based this conclusion on the fact that there was no evidence to support the belief of importation through the agency of man. Whether the progress of the disease at Toulon and Marseilles has led M. Fauvel to modify his opinion I have not heard, but up to the present certainly neither he, nor any one else, has been able to specify the channel through which it was introduced.

There are now several other instances on record in which malignant cholera broke out at points distant from where it was prevailing as an epidemic, and though the earliest cases were noted, and the attendant circumstances most carefully examined, no evidence could be found of importation of the disease by man or ships. The outbreak at Southampton and its vicinity, and at Theydon Bois in Essex, in 1865, the former of which was investigated by the late Dr. Parkes, and the latter by Mr. Radcliffe, both of them most careful and experienced observers, were of this description, and, after exhausting every line of evidence they could think of, these gentlemen (who firmly believed in the importation of cholera) were obliged to admit they were unable to find anything in their history to support that view. The outbreak at New Orleans early in 1873, which was the commencement of the epidemic which overspread the valley of the Mississippi in the course of the summer of that year, was of the same

description; the first cases occurred in persons who had been in the country for a long period, no case of cholera had been introduced from abroad, and no vessel had recently arrived in which cholera had existed during her passage, and the members of the Board of Health, after carefully enquiring into every circumstance connected with the earliest and subsequent attacks, came to the conclusion that the disease was of local origin, and had not been imported. A year afterwards Assistant-Surgeon Van Buren Hubbard, of the United States Army, attempted to cast doubt on the conclusions of the New Orleans Board of Health; he admitted it could not be established that any case of cholera had been introduced early in 1873, and his other statements, as to arrival of emigrants from Europe or elsewhere, were so indefinite as to dates and circumstances, that they were quite inadequate to support his conclusions.

The outbreak in Russia in 1869 commenced at Kiew, in May, with sporadic cases, at first thought to be cholera nostras, but as the season advanced these became more numerous, and it was apparent an epidemic was commencing. At this time there was no cholera in Southern Russia, or nearer than the southern end of the Caspian Sea, about 1700 miles distant from Kiew, and there was no evidence of importation from that point or elsewhere. There had been 83 cases and 35 deaths from cholera in the province of Kiew, and 777 cases and 270 deaths in other parts of Russia in 1868, the latter occurring sporadically, mostly in Petersburg, Moscow, and the provinces to the west of them, during the hot weather, many of which were considered at the time to be cholera nostras, but the high mortality indicates that a large number of them must have been malignant cholera. The Russian physicians, unaware at the time of the course of cholera in India and the intermediate countries in the two previous years, attributed the epidemic of 1869 to a mere recrudescence of that which affected their country since 1866, but as a recrudescence involves the restoration in force of

some factor or factors necessary to give diffusion to the epidemic, it is more in harmony with the usual progress of cholera to attribute the accession of power to the epidemic influences then advancing from the South than to a reinvigoration of those previously in operation on the spot, and which had then passed away.

There was a remarkable outbreak of cholera near Broussa, on the south side of the Sea of Marmora, commencing in July 1871; this was first seen at a village named Tchardy (Harmandjik on Keippert's map), 36 hours distant from, and south of Broussa, and with Mount Olympus intervening. The disease spread to Taouchanly on the road to Koutahia, on the one hand, and to Kassaba and Broussa on the other. It prevailed at Taouchanly from July 8th to September 4th, and caused from 250 to 300 deaths. At Broussa it commenced on August 4th, and terminated on September 12th, having caused 51 deaths; at Tchardy there were 21 deaths, and there were fourteen other villages in this space, in which there were 145 deaths. According to the reporter, Dr. Mordtman of Constantinople, who investigated the outbreak on the spot, importation could not be traced, and cholera is not known to have been prevalent nearer this locality at the time than Southern Russia, and the north of Turkish Kurdistan.

There was a severe epidemic of cholera in Syria in 1875. This commenced at Hama in March, and spread extensively during the course of the summer. Neither previous to its appearance, nor during its progress, was there any cholera known either in the Turkish possessions on the Red Sea, or in the valley of the Euphrates, and Dr. Pestalozza of Beyrout, who was sent to the scene of the outbreak to ascertain the nature of the disease and its origin, declared it to be malignant cholera, but he was unable to discover any source exterior to the town from which it could have been derived.

These instances leave no alternative but the conclusion that malignant cholera may, and has broken out, and become epidemic at points far distant from those where it

was already active, and without any communication with them that could be traced, either by man or fomites. In other instances, persons coming from a locality where cholera was prevalent, and with the disease either active or incubating, have arrived in a new one where it was impending, and where some sporadic cases have actually occurred; in such circumstances the latter are usually put aside as being merely cholera nostras, and of no significance, and it is forthwith assumed that the fresh arrivals imported the germs of the disease, and originated the epidemic which followed. Before this inference can be established, however, it is clearly necessary that the possibility of the epidemic having arisen altogether independent of the arrival of the sick must be excluded, which the evidence, as usually presented, does not enable us to do.

From what has just been said, it will be obvious that sporadic cases of malignant cholera are of importance, as showing the presence and activity, in a given locality, of the factors necessary to give origin to that form of the disease, previous to the arrival of any one actually labouring under it, and it may here be shown that such cases are not chance occurrences, but bear a definite relation to approaching or passing epidemics. If the mortality from cholera in the Registrar-General's Return be examined, it will be found that it fluctuates a good deal in what are considered non-epidemic years, and when looked at more minutely, it appears that in those years in which there has been a marked increase in the rate, there has been, not only more of the ordinary summer cholera, but also a greater number of sporadic cases in the malignant form, and occasionally these occur in groups constituting local outbreaks, presenting all the characteristic features of the epidemic disease, though running their course, and disappearing without having extended beyond the limited locality in which they arose. Of this description the following are instances accompanying passing epidemics. In 1836 and 1837, cholera had been epidemic in Sicily and parts of Italy, and in the latter year it affected part of Germany and Russia. In August, 1837,

four cases, and two deaths, occurred in the *Dreadnought* Hospital Ship in the Thames, and in October, between the 8th and 28th, there was another outbreak in her, in which there were twenty attacked, of whom twelve died, when the disease ceased. In this year also there was a sporadic case near Edinburgh, in September, which recovered, another in November, and a third in December, both of which terminated fatally. There was also a severe outbreak in the House of Industry at Coventry, between 7th of January and 5th of February, 1838, during which there were fifty-five deaths from cholera. In 1859, when cholera was prevailing more or less along the West of Europe, from the south of Spain to Sweden, there was an outbreak at the Coast Guard Station on Southampton Water, near Netley, between the 3rd and 17th of July; there was an extraordinary outbreak of diarrhœa and cholerine in the Manchester Prison, commencing 28th of September; and at Glass Houghton, a village near Pontefract, in Yorkshire, there were twelve deaths from cholera between 1st and 17th of October. There was also a sharp outbreak towards the end of summer at Wick, in the north of Scotland. In none of the above instances was importation made out.

As illustrating the presence and operation of causes sufficient to engender malignant cholera, far in advance of an approaching epidemic, and before any one labouring under it had arrived, the occurrences at Southampton and Theydon Bois, already noticed, may be mentioned, and there is the additional evidence that, in June, 1865, a case of cholera, indistinguishable from the epidemic affection, was admitted into Guy's Hospital, under the care of Dr. Wilks, which recovered; but, on the 27th of June, another case, having all the characteristics of the epidemic affection, occurred in the metropolis, and ended fatally on the 28th. In Scotland, where the deaths returned as cholera in 1864, were 2 in 100,000, they rose to 7 in 1865, and in the epidemic, during 1866, to 42. In Denmark, and south of Sweden, in 1865, cholerine, accompanied by an unusual number of cases with the character of malignant cholera, was much more

common during 1865 than for several years previously. Through this extensive area then there were undoubted indications of the presence and activity of the causes of malignant cholera in 1865, though nowhere did the approaching epidemic actually reach them in force until 1866.

In 1868 there was another modification, which may be regarded as the extension to Central Europe, that year, in an attenuated form, of a severe epidemic which had prevailed in Italy and Sicily the previous year. The epidemic of 1866 still lingered in the Northern Departments of France, in Holland, and the Rhenish provinces of Prussia; also in Gallicia, Poland, and neighbouring districts of Prussia and Western Russia in 1867; but during that year disappeared at all of them. In August a fresh outbreak commenced at Zurich, in Switzerland, and another at Friensheim, near Manheim, the same month. In August, 1868, two settlements in the district of Lipowitz in the Government of Kiew, were attacked severely with cholera and 70 cases, of which 29 died, occurred between the 10th and the end of the month, besides 13 more, 6 of them fatal, in other parts of that province. There were also, as already mentioned, 777 cases and 270 deaths occurring sporadically in St. Petersburg, Moscow, and the provinces to the west of these cities. On the same day an outbreak commenced in a valley near Relinghausen, in Essen, Germany, which went on to the 4th September, and caused 38 deaths. About the same time choleraic diarrhœa, with cases of cholera nostras, and some of cholera in the malignant form, became prevalent in this country. At Aldershot, when this outbreak was well marked early in August, a man died of malignant cholera on the 13th of that month, having been attacked the previous day. In England and Wales the mortality from cholera rose from 4 per 100,000 in 1867 to 7 in 1868, and in Scotland the numbers per 100,000 were the same in these years respectively; showing that Great Britain was under the same general influence in 1868 as the parts of the Continent above mentioned, and about the same time.

Such are some of the more extended epidemiological relations of cholera, in countries in which it is but an occasional visitant. These have not yet received their due recognition, but it will be obvious to anyone who considers the subject dispassionately, that no theory as to the nature and mode of diffusion of cholera can represent the real facts which does not embrace them. The evidence hitherto collected as to the connection between the diffusion of cholera and the movements of man, which has appeared to so many to justify a specific theory, is far from representing all the influences in operation, and, instead of regarding it as in itself sufficient to form the basis of a trustworthy induction, it will be found that its true significance can be arrived at only when considered in subordination to those more general factors indicated above.

The announcement by Koch that he had discovered a bacillus of a particular description in cholera evacuations, and the mucous membrane of the intestines of persons who had died of the disease, created great interest, and his confirmation of his experience in Egypt by what he found in Calcutta, led many to hope we were now on the eve of explaining the mode of origin, and means of diffusion of the exciting cause of that complaint. He described this bacillus as resembling the comma, and said it was destroyed by acids and by dry air, while it grew freely in alkaline fluids and on damp surfaces, such as clothing soiled by the alvine discharges in the disease, or in water; and as he found it in the intestinal mucus and submucous tissues, and the contained fluids only, and in neither the blood nor any of the other organs, he concluded it must have got there in the first instance through the stomach, in food or other substances swallowed. As he failed to find this bacillus in the discharges or intestines of persons who had died of other forms of bowel complaint, he was led to the conclusion that it was characteristic of cholera, and the detection of it in a tank, from which a number of people took their water, seemed to bear out to some extent the impression that it was intimately connected with the origin of the

disease. At Toulon recently, Koch has again met with the bacillus, and, if we can trust the accounts which have appeared in the newspapers, seems to have recommended a series of measures for preventing the transmission of cholera from one country to another, or, when introduced, from one person to another, which consists mainly of using means for destroying the bacillus in the various positions it may be found, as soon as emitted from the body of the sick, and of avoiding many ordinary articles of diet unless they have been rendered harmless by the application of heat.

Objection has been made to the inference of Koch, that the comma bacillus is pathogenic, that cholera may arise from matter inhaled, not swallowed, and the blood contains no trace of the bacillus, or even of a micrococcus that might give rise to it; and Drs. Lewis and Cunningham showed, as long ago as 1873, that when compared with the blood of healthy persons, that from cholera cases, in addition to an unusual number of white corpuscles, presented a different condition of the red corpuscles, which was manifested by their tendency to aggregate in irregular masses in place of forming the normal rouleaux, and in ordinary preparations, when any pressure was exerted, and in which there was any movement of the fluid, in the ease with which the corpuscles altered their forms, were drawn out into irregular processes, or adhered to one another by elastic protrusions, while there was a complete absence of bacteria or fungi, or other extraneous bodies. It is even questioned whether the comma bacillus can be considered pathognomonic of cholera; a writer who signs with the initials E. K., in *Nature* of 10th inst., states he had seen and was familiar with the appearance of that organism in Koch's preparations, and that he met with a similar one, undistinguishable either in form, or in the way in which it took the colouring, in the evacuations of persons who had been affected with a severe form of diarrhœa, in a district of Cornwall, late in 1883. The exact nature of the diarrhœa is not mentioned, but it does not seem to have been cholera.

The epidemic continues at Toulon and Marseilles, with a mortality varying from day to day, but not showing any indication of permanent reduction as yet. Numerous deaths are said to be occurring at Arles, and other cases are reported from the slopes of the Alps to those of the Pyrenees, but how far the latter consist of persons who have left Toulon or Marseilles, with the disease in the incubative stage, does not appear. The Paris papers, on Saturday evening last, stated three deaths from cholera had occurred during the day, which the correspondent of a London paper, on enquiry at the Prefecture of Police, was assured could not be attributed to Asiatic cholera. On Sunday two fresh cases are said to have occurred in Paris, and a third outside the city gates at Pontin; the correspondent adds: "There is no reason for a false alarm, since they are cases of sporadic cholera." M. Fauvel's prognostication regarding the course of the epidemic at Toulon has already proved erroneous, and it would be a great mistake to repose confidence in a similar one with regard to Paris. That the epidemic will extend northwards is most likely, and sporadic cases afford an important indication of where it is about to appear, but even these may not be followed by the disease in force, as was the case across Europe, from this country to Russia, in 1868.

DISCUSSION.

The CHAIRMAN said he much regretted that there was such a small meeting to discuss this paper upon a question which was known to every person in England to be one which might personally concern the entire community within the next three months. He did not know what might have taken place in various learned societies, but he had heard nothing from any one, bearing upon the question of the present position of cholera in Europe, so thoroughly important as the paper which had just been read.

Brigade-Surgeon SCRIVEN said this subject was of the greatest possible importance at the present moment. His views were in many respects widely divergent from those of Dr. Lawson. On the present occasion he would not attempt to argue the matter fully, because it would occupy too much time, but there was one point in the paper to which he must refer, viz., the statement that there were some who believed epidemic and sporadic cases of cholera to be altogether different in their nature. Now his opinion was that sporadic and epidemic cholera were the same, just as a true case of sporadic small-pox was exactly the same as one of epidemic small-pox. There was, however, much more liability to error in the diagnosis of cholera than of small-pox; many cases were put down as sporadic cholera which were simply bilious attacks, or cases resembling cholera. The last paragraph of Dr. Lawson's paper appeared to be rather against the views put forward by the author; for it was admitted that the disease was travelling in the great lines of human communication; that it was now in Toulon and Marseilles, and was likely to be, if it were not already, in Paris, and that it was not impossible it might spread all over Europe, perhaps to England. He had been told that the opinion, which he held in common with many others, that cholera was communicable, was a very inconvenient opinion, that the result was that it frightened people and made it difficult to obtain attendance on the sick. He quite admitted that difficulty, but it was one with which medical men had to grapple. On the other hand, we in this part of the globe had to remember that it was exceedingly inconvenient to have cholera imported into Europe, and in his opinion it was impossible to contend with it unless we recognised its true nature as a contagious malady. Again he was told that on another ground his view was very inconvenient, as it necessarily led to quarantine, but that he denied; the necessary result was not quarantine, but medical inspection, surveillance, disinfection of ships, burning of infected clothing, and so on. Here also, on the other hand he might speak of

the great inconvenience of the opinions of his opponents, of which the necessary result was that they did nothing directed against the disease itself, but contented themselves with sanitary improvements, such as he likewise held to be necessary, though not to be *all* that was necessary.

Taking the whole mass of scientific men, the anti-contagionists would be found to be a very small proportion, but in England and in India, if they were a small minority, they were a very influential and very active minority, active not in the suppression of cholera, but in the propagation of their own views. He was sorry also to see there were symptoms of activity in the suppression of the views of others. He held in his hand an extract from a letter from the Sanitary Office at Calcutta, referring to a report which was sent from Madras, in which report it was stated that cholera had been spread in the Presidency of Madras by human communication. Commenting on this the secretary said: "There can be no doubt that the publication of such theories as are contained in this report is likely to prove most embarrassing, especially at the present time, when the International Sanitary Boards at Constantinople and Alexandria not only eagerly accept these theories, but immediately proceed to put them into practice to the great disadvantage of India." He begged attention to the reason why these theories were so embarrassing; the danger was that the International Boards would get hold of them, and act on them. In another letter from the same secretary, on the same subject, he went even further, and distinctly discouraged investigation. His words were these: "Officers of all grades, instead of wasting time in imperfectly tracing out doubtful connections of cholera contagion should devote themselves to improving the health conditions under which the people live, in order that cholera, when it does appear, whether coming from without or evolved locally, may fail to find those congenial surroundings in which experience shows that it is most likely to

develop and spread." The last part of that sentence he could take no exception to, but the first part he thought deserved the unanimous condemnation of the medical profession. The word "imperfectly" was certainly used, but if the secretary had desired a *perfect* tracing out, it would have been well to say so. This endeavour to crush public opinion had not been entirely confined to words, for it had taken serious effect in deeds. In the British Medical Journal of June 28th, it was related that Dr. Duncan read a paper in India at the North Western branch of the British Medical Association, in which he criticised very strongly the views that Dr. Cunningham, Sanitary Commissioner with the Government of India, had expressed in a paper read at the Epidemiological Society in London about a year ago, and the result as stated in the British Medical Journal, was as follows: "Dr. Duncan, who had just been gazetted to the medical charge of a regiment of Bengal Lancers, had his appointment cancelled, and was handed up to the Commander-in-chief for conduct prejudicial to military discipline, for subjecting the action of his military superior to criticism." This mode of proceeding reminded one of the despotism of mediæval times, rather than of the freedom and good sense of the nineteenth century.

Dr. LAWSON said he disclaimed any such sentiments.

The CHAIRMAN said no protest of that kind was needful for a moment. They must be all aware that there were two parties who differed very essentially, not in the treatment of cholera, but as regards its causation. As being himself one of Dr. Lawson's party he thought it best to let Mr. Scriven say anything he chose regarding the opposite party. He thought, perhaps, there were some on both sides who did not carry on the controversy quite fairly.

Mr. SCRIVEN said he quite accepted Dr. Lawson's disclaimer, and had no idea whatever that *he* wished to crush public opinion, but there was evidence that an attempt had been made to do this. It seemed to him

that the aim of the opposite party was to crush public opinion and discourage investigation, to do nothing against cholera itself, and to keep the International Boards in ignorance lest they should be troublesome. In that same room some weeks ago Professor De Chaumont spoke of such views as *nihilistic*, and he thought there was good reason for the term. The anti-contagionists stood in the same relation to cholera as the anti-vaccinationists did to small-pox, for they did nothing against the disease itself. A very amusing episode to what he had related was the appointment of Surgeon-General J. Cunningham himself to do the very thing he discouraged others from doing, viz., to inquire into the origin and contagious character of cholera. He presumed he had appointed himself for this purpose, but he was afraid they could not expect any very good results from a man so wedded to a preconceived idea: he had, associated with him, the very distinguished professor of physiology at Calcutta, and he thought that gentleman would deserve a great deal of credit if he gave an independent opinion in the presence of his chief, having before him the example of a brother officer who had been just deprived of his post for criticising Dr. Cunningham's views.

At the same time he admitted it was most difficult to check in any way the spread of cholera. We had to deal with a very intractable International Board in Egypt, which consisted of very discordant elements, having representatives from almost every power in Europe, whose opinions were widely divergent from ours; still we ourselves were partly to blame for the difficulties which arose, because we presented to European nations the unhappy spectacle of a people, and a government, divided against itself; one part of the government putting forward views of one kind, and another views of another kind, the consequence being that foreign nations could not tell what to make of us, and unfortunately the department that dealt with these foreign nations was a portion of that same nihilistic body to

which he had referred: and as they refused to do anything directly against the cholera itself, other European nations ran into the opposite extreme, imposed quarantine on everybody, and especially on the English.

With regard to the remedy, he thought there should be a reconstitution of the International Board. Instead of a number of gentlemen sitting at Alexandria deliberating on telegrams received from distant parts, there should be an active body of men who would board every vessel that came to Suez, examine her condition, remove the sick to hospital, and let the ship go upon her journey as soon as she had been disinfected and made safe; indeed many of the necessary precautions might be effected while the ship passed along the Suez Canal, so that little or no delay need take place: and furthermore, as this board consisted of representatives of almost every nation, it would be quite possible that a ship belonging to any nationality should be looked after by the representatives of its own country, and by that means international jealousies would be reduced to a minimum. But in order to do this it was necessary to have a common principle to start from, and to agree on a common action, and could not something be done towards that? They ought somewhat to merge their differences of opinion. All present would agree that none were infallible, and if they could not all affirm that cholera was contagious, could they not all admit that it *might be* contagious? if so, they might proceed on the graver assumption, and deliberate with their brethren on the continent as to what were the best means to contend with a contagious malady. Besides a reconstitution of the board, there ought to be three floating hospitals for treating cholera cases, one at Suez, one on Lake Timsah, and a third at Port Said, with two or three steam launches for the use of the medical men, and to transport the sick. No doubt the objection would be raised that the Egyptian government would not consent to cholera hospitals in their country; but we had to educate the Egyptian Government

in other matters, and the sooner we did so in this the better Both contagionists and non-contagionists would agree that there was no likelihood of cholera spreading from well regulated hospitals, especially if they were kept at a proper distance from the shore.

All the regulations he had suggested of course were not applicable to vessels whose final destination was Suez; many such vessels carried pilgrims returning from Mecca, and he was told that if a ship had cholera on board, it was sent away, just as it was, sick people and healthy people together, either to Moses' Wells across the Gulf of Suez, or to El Tor 140 miles off. No system could be conceived more barbarous and cruel than this. These ships ought to be treated nearly as the *St. Dunstan* was at Liverpool; the healthy people (who would not be Europeans but Arabs), should be made to bathe and put on clean clothes before they landed, and as far as possible their names and addresses should be taken, in order that they might be watched; the sick should be sent to hospital, and the ship should be then disinfected, and the infected clothing burnt. If the number of sick on board were too many for the hospital, the ship itself should be turned into an hospital, after the removal of the healthy, and kept at any desired anchorage; or if thought better, she might now be sent to Moses' Wells or to El Tor.

Finally, he would repeat that what the English people really wanted, in order to manage better in concert with other European nations, was more unanimity at home, and more moderate counsels abroad. It was our differences at home, and the arrogance with which we laid down the law abroad, which caused a great many of the difficulties we had to contend with. He would conclude with a quotation from the "Times."

"In another article on the cholera, Professor Virchow demands very much more strict surveillance of the Suez Canal, the main, if not the only channel, by which the disease travels from Asia to Europe, and where effective preventive measures are alone possible."

Surgeon-General JOHN MURRAY said, in the present state of excitement and panic in France and on the Continent, and with the prospect of cholera soon appearing in England, I think it would be useful, and tend to avert similar unreasonable acts, to give a short account of how cholera epidemics are treated in India, where absence of epidemic attacks is the exception to the rule in ordinary years, and where the mortality is recorded by hundreds of thousands, and in 1877 amounted to 627,579. An annual mortality exceeding 100,000 is not uncommon; but, were cholera not restrained by the measures pursued by Government, it would be much greater.

Panics are very dangerous in depressing the spirits of the individual, and leading in many instances to the neglect of attendance on, and attention to the sick, and even to the desertion of the dying and the dead. These panics arise from ignorance of the disease, combined with want of trust in the administration of the Government, and lack of faith in the executive or doctor. The disease is very fatal, and in many instances medical aid is of no avail, especially when late in being applied; but experience shows that when applied in the earlier stages of the disease very simple remedies will check, and generally cure, a large proportion of the cases. It is on this point I wish particularly to call your attention to the practice in India. This is not a time or place to argue on the various theories of the disease, and whether Dr. Koch's microbe is the true cholera microbe, or only one of the legion of microbes visible in cholera evacuations, which further research may find in many situations unconnected with cholera; nor to discuss M. Pasteur's hope of cultivating the germ, and producing a milder form of cholera, which, like vaccination in small-pox, might prove a protection from the disease. In so far as a severe attack of cholera affords no protection from subsequent attacks, it is not probable that a milder attack of cholera would be more efficacious. There are one or two practical points which guided the measures of Government in 1861 which will elucidate

the practice then enforced, and which still prevails. The first is, the early recognition of the presence of the disease. Up to that date the stage of malaise was not usually recognised, while the second stage of diarrhœa was loudly denied by many, who stated that cholera could only be recognised when collapse and suppression of urine were present. It is my opinion that those who do not diagnose cholera till the stage of collapse has arrived, will sacrifice many sick who might have been saved. The earlier the disease is diagnosed, the simpler and milder the remedies required to assist Nature to conquer it. The medicine recommended and generally used in India is a mild carminative pill, which if taken needlessly will do no harm, but which when taken early has checked the disease in tens of thousands of cases. If the cholera pills are not given till collapse has supervened they are powerless, as well as the strongest stimuli. I do not consider the chemical ingredients of these pills as antidotes to the poison, but they are stimulants to the stomach whilst its sensibility, though impaired by the presence of the poison, is not paralysed, as it is in collapse. The action of the medicine is to promote the action of the stomach in the secretion of the gastric juice, which is known to be the most powerful agent in destroying all the microbes, or lower vitalities, which accompany or produce putrefaction or fermentation. The excessive rapidity with which these lower vitalities increase when unrestrained is a fact of natural history; they multiply by tens of thousands in a few hours. The stomach and intestines appear to be the primary seat of the germ. Should this view be correct, it would explain the extinction of the disease in the earlier stages without critical evacuations, by the increased flow of gastric juice, caused by the carminative action of the medicine causing their destruction and digestion. When cholera runs its course the inner or involuntary life becomes paralysed, whilst the outer or voluntary life continues in action, and the mind remains clear till life slowly fades away. The practice in India to which I now allude is, the general distribution

over the infected country of the carminative cholera pills referred to. They are distributed through the police, with instructions for their use, and an earnest command for their early application. The success of these measures is reported by all the civil authorities as most satisfactory, whilst any want of success is equally attributed to delay in their use till the disease had advanced to the stage of collapse. The treatment of the disease after this stage can only be conducted by the members of the medical profession, and only effectually by those who have assiduously studied the disease and observed the action of the different remedies in aiding Nature to overcome it. With regard to the prophylactic treatment, the measures employed are directed to restrain the dissemination or spread of the disease from the sick to the well by the isolation of the affected, and by the removal of causes which experience has proved to facilitate its development, such as non-sanitary states, of crowding, impure air, water, &c.

The question of the communicability of cholera through human intercourse was answered by the Official Reports of the Hurdwar epidemic of 1867, when an assemblage of 2,800,000 pilgrims was attacked in April, and in returning to their homes progressively spread the disease in all directions for 500 miles over the N. W. Provinces and the Punjaub, and extended it for 500 miles further to the west in Scinde. This point was confirmed by the Hurdwar epidemic of 1879, when 800,000 pilgrims were assembled and attacked in a similar manner; and again spread the disease all over the country, where it appeared at nearly the same dates, concomitant with the arrival of the pilgrims. The chief difference was that it arrived a few days earlier in some of the distant Punjaub districts, and two months earlier in Scinde, as the railway which was used by the pilgrims in 1879 was not constructed in 1867, and many of the dead and the sick from cholera were removed from the trains along the line. In none of these places was the disease present previous to the arrival of the *pilgrims*, and in some parts of the Punjaub it had not been

present for ten or twenty years. I have, therefore, no doubt that the disease is communicable, but the channel by and through which it is communicated is often doubtful. Our experience in India shows that personal contact is not the ordinary channel, as proved by the relative exemption of hospital attendants, and more clearly by the great proportion of villages attacked in severe epidemics in which only one death is recorded, or when only two appear, as in many instances these were two affected pilgrims or visitors. In four late epidemics (1877-8-9-80) there were 154,986 villages attacked. In 58,972 of these there was only one death, and in 20,596 only two deaths, and yet in these years the total mortality was 1,380,226.

A thorough knowledge of the channels through which the disease leaves the body, as well as the channels through which it enters, and also of the changes through which it passes when outside the body, and what develops or impedes its action, and to what articles it most readily attaches itself, are important questions, a knowledge of which is essential to those who legislate for the protection of the people from this fatal disease, but they are not points suitable for discussion here, even if time admitted it.

The practical part of the subject, which I should like to allude to now, are the means employed by the Government of India for protection from the disease.

For troops and prisoners the measure that has proved most beneficial has been removal into camp, with the isolation of the affected, and prompt treatment. But these measures are not applicable to the civil population of large towns, and hospitals are there provided for the treatment and isolation of the sick and proper medical attendance. Medicines are distributed all over the towns by the hands of the police, with instructions as to their use, and the necessity of early application is enforced, as a delay for one or two hours in many cases involves the safety or death of the affected. Similar measures are applicable here should the disease reach London, and a knowledge that the authorities are prepared for its advent

would ward off a panic, such as now spreads so rapidly in other countries.*

Sir WILLIAM GUYER HUNTER said they were assembled to discuss a paper by Inspector-General Lawson. One object, among others Dr. Lawson had in view, was to shew that previous to an epidemic of cholera breaking out sporadic cases occurred here and there, in distant places in the country about to be visited by the scourge. With this view he entirely concurred. The two previous speakers had not attempted to refute or support their views, but had gone out of their way somewhat to introduce matter foreign to the question at issue into the discussion. The last speaker, Dr. Scriven more especially, had sinned in this respect, and had made a most unjustifiable attack on Surgeon-General Cunningham, the Sanitary Commissioner with the Government of India, accusing that officer of wishing to suppress views on cholera opposed to his own, because he had found it necessary to report Dr. Duncan to Government for insolent and insubordinate behaviour. The circumstances out of which this unpleasant affair occurred are simply as follows :—A branch of the British Medical Association had been established in the north-west provinces in India. At a meeting of the society, Surgeon-Major Duncan read a paper criticising Surgeon-General Cunningham's opinions on cholera. A fair criticism no one could object to, but the vein of insulting irony which ran through Dr. Duncan's paper it was impossible to overlook; he justly paid the penalty of his act, Government not permitting him to take up an appointment to which he had been gazetted. The Chairman and one or two other

* The medicine most generally used is composed of one part opium, two parts asafœtida, three parts black pepper, made into 5 gr. pills. This will generally cure, or at least it will delay the course of the disease, till medical aid can be procured. These pills relieve the *spasms* which obstruct the flow of bile through the hepatic duct. In fatal cases the gall bladder is always found distended with dark bile, which is entirely wanting in the intestines. Experiments prove the bile to be most powerful in restraining the development of all the *lower* vitalities, including those found in cholera evacuations

members of the Society remonstrated with Dr. Duncan at the tone of his paper when it was read. So much then for the value of the statement made by Dr. Scriven that in India independent and free discussion of opinions on cholera held alike by the Sanitary Commissioner and many other medical officers of experience is suppressed. Having thus disposed of Dr. Scriven's unfounded accusation, he stated he should now proceed to make a few observations on the paper before the conference. The history of the outbreak of cholera at Toulon is a repetition of the history of the outbreak in Egypt of the previous year. To Toulon it was stated to have been imported from Cochin China by the *Saarthe*. To Damietta it was reported to have been imported from Bombay by the *Timor*. Careful investigation led to the conclusion that the disease had not been so imported, but that it had existed in both countries antecedent to the arrival of the suspected vessels, waiting only for those other conditions, now fairly well recognised, to assume the epidemic form. In France, as in Egypt, the failure to trace its importation led to an opinion being entertained by some authorities that the disease was a local cholera, a cholera nostras, or choleroid, which would not assume a severe form and would not spread. Except in the fact of its being of local origin, time has shown how fallaceous those views have been. Another circumstance deserving of careful observation is the recurring frequency with which the term sporadic has been applied to the disease when it has first made its appearance in any locality, and how careful the authorities have been to assure the people that the disease was sporadic and not Asiatic cholera. Now there is no difference whatever, clinically and pathologically, between sporadic and Asiatic cholera. They are one and the same disease. Cholera is recognised by a certain group of symptoms, and when those symptoms are manifested in any individual case it should be reported as cholera and recognised as such. In India the term cholera only is allowed to be used under such circumstances, and were the same restric-

tions in nomenclature insisted on in Europe and in Egypt, much confusion would be avoided. It is merely playing with words to talk of cholerius, choleraic diarrhœa, cholera nostras, sporadic cholera, Asiatic cholera, &c., &c. Since the appearance of the disease at Toulon on the 23rd of June, it had spread to Marseilles and thence to Nismes, Arles, &c. On the 29th of June a case is reported to have occurred at Saluzzo, in Italy. On the 23rd of July a severe case of cholerine occurred at Tenesvar in South Hungary. On the 4th of July a sporadic case is reported at Paris. A sporadic case is next heard of in Transylvania, then a case is reported at Constance; the Swiss Government said the man died of diarrhœa. From Berlin, on the 14th of July, two cases are reported to have occurred at Solstouscha, in Russia. It was but the other day a question was asked in the House of Commons, whether some severe cases of diarrhœa of a very suspicious nature had not occurred in London, which certain medical officers had refused to certify. The President of the Local Government Board is reported to have said, he doubted very much their existence, otherwise he should have been informed. Dr. Amand Leslie, one of the twelve medical officers sent out by Government to Egypt last year for service during the cholera epidemic, informed me that previous to leaving London he had seen a case, which, had it occurred at Constantinople, he should have considered to be cholera; the medical man in attendance on the patient considered it merely a case of diarrhœa, and certified accordingly. Dr. Leslie had great experience in cholera, having lived long in the East, and was killed, he regretted to say, when Baker Pasha's force was annihilated in the Soudan. The last report of the Registrar-General showed that diarrhœa had increased considerably in frequency and severity. Last week, according to a return in the 'Medical Times,' the death-rate from diarrhœa was half as large again as in the preceding week. To those experienced in the history of cholera, it was a well-recognised fact, that when that disease was on the move,

diarrhœa and bowel diseases increased greatly in frequency and assumed a very fatal form. Last year in Egypt, the existence of cholera was not officially recognised until the 22nd June. In his report to Government he proved incontestably that the disease had existed in the country since 1865, and probably antecedent to that period, and that it had raged in numerous villages in the Delta months antecedent to the 22nd June. This statement was at first received with incredulity, and many have ventured to express opinions on the subject, but no one has ventured to dispute the facts which he had collected. Dr. Scriven had stated the International Sanitary Board at Alexandria had failed in its duty in not exercising a proper supervision of vessels arriving at Suez from the East, and thus left a loophole for the importation of the disease. Now it must not be forgotten that there is not one instance on record of cholera having been introduced into Europe by the sea route. Dr. Scriven speaks of the International Sanitary Board of Egypt. Now there is no such thing as an International Board in Egypt. It is a local council instituted by the Khedive in 1881, and is in no sense an International undertaking. That reforms in it are urgently needed cannot be doubted. At present it is far more a political board than a sanitary one. There is one more point to which he would like to make passing reference before resuming his seat, that was the present scare about the importation of rags. Now it only needs to be stated that cholera has never been introduced into this or any other country through rags.

Surgeon-Major PRINGLE thought the subject they had met to discuss was one of the greatest importance, in view of what was now taking place on the Continent of Europe, where cholera was raging in the South of France, and no one could tell what country it would next attack. As the result of his practical experience and personal observation, he laid it down as a rule that the massing together of crowds, for any purpose whatever, be it for military gatherings or religious festivals, when a cholera influence was

prevalent, and at certain seasons of the year, was a measure attended with the greatest risk to human life; and when these gatherings were to be held in localities like Hurdwar, which no amount of money could place, much less maintain, in a sanitary state, it was actually inviting disaster, with possible consequences which no one could foretell. He did not believe in either the contagion or infection theory of cholera, but he did believe in local insanitary conditions, of which overcrowding was among the chief, producing the conditions for the development of cholera when the cholera influence was present, which often resulted in the disease breaking out in what seemed a universal manner. Were cholera either contagious or infectious like small-pox, he believed India would be decimated; it required for its development and increase conditions not at all necessary in the development and spread of small-pox, and they might be summed up in what is known as an insanitary condition of the locality itself, and the people inhabiting it.

Dr. EDWARD HAUGHTON thought they were much indebted to Dr. Lawson for the clear exposition he had given of the localities visited, and the general conditions under which cholera had been observed. The maps would, if studied, convey to the mind of a person who knew but little of the subject, certain elementary truths with regard to the conditions of cholera, as showing that it had a tendency to reappear very often in the same localities, at all events, although the choleraised district might have become extended. In the report upon the epidemics in London, issued by Drs. Sutherland and Ranger, it was noted that although cholera had been absent for sixteen years, yet the first cases which appeared were in the same streets as those formerly attacked, and in the same houses and parts of the same houses. Although it was instructive in one way, it was deplorable in another, because it showed that the insanitary conditions which had favoured the appearance of cholera before had not been remedied. The fact that there were so few persons present that day proved that there was

not much cholera scare in London, but if they had been living in the south of France they would know what a real cholera scare was, for there even the officials were running away, and neglecting their duties. The last account from Marseilles gave 53 deaths in one day, but that did not frighten him, for if anyone considered the conditions under which Marseilles existed, and had the means of observing the insanitary conditions of the place, they would not wonder that there was that number of deaths, but would wonder why the number was not twice as great. Now what were the facts? According to the statement in the 'Times,' the sewage of the town was conveyed into a tideless harbour, and the condition of this sewage was simply horrible, and could result in nothing but evil to the inhabitants of the place. In Toulon, the sanitary conditions were even worse than at Marseilles. The outbreak of cholera certainly did not arise at Marseilles from the water supply, because they had a most splendid water supply, such as Londoners might envy. Notwithstanding the statement in the 'Times,' that London had the purest water, he maintained that, unless something was done to alter the present state of affairs, an epidemic would soon occur, arising from an analogous, though not the same source, as that at Marseilles. What was wanted to prevent an epidemic was good water, good food, and good air. A comparison had been made by one speaker between small-pox and cholera, but there was one point of distinction which might perhaps be noticed. When an epidemic of small-pox occurred, as it had frequently done within the memory of those living, he defied anyone to say that the annual death-rate was very much increased by a single epidemic, and this effect had been noticed by the Registrar-General, and also by Dr. Farr. The death-rate was not affected unusually by the small-pox epidemic, though the case was quite different when a cholera epidemic prevailed. During the great epidemic of 1871 and 1872, the 'Times' newspaper published a statement that the annual death-rate was below the average of three years, and that was the greatest epidemic

of small-pox which anyone could recollect. The only good point about a cholera epidemic, if there was any good point at all, was that there was no nostrum against it, and that the necessary sanitary regulations must be carried out. People were put upon their mettle, and although it would temporarily increase the death-rate, at the end of two years the balance would be so far reduced by improved sanitation that you could not say you had lost a single person in consequence of its coming here. If people were put upon their mettle to improve the water supply, to clear out the drains, and to trap all pipes connected with the houses, they would have not only no epidemic of cholera, but the death-rate would be diminished in ever so many other ways. The matter was in their own hands to a great extent. The unreasonableness of the Italian Government was shown in a letter recently published in the 'Times,' stating that, at a small station in Italy where there was only accommodation for fifteen people, the Government crowded some 500 tourists, and kept them there for five days under insanitary conditions. He thought that the ordinary quarantine was the placing of a number of unfortunate people, possibly some of them sick, under conditions which were quite enough to make people that were well sick, with the view to the prevention of any further sickness, a more preposterous and idiotic conception than some of the quarantine regulations could hardly be conceived. Although people might differ upon the point of whether quarantine was necessary, he was glad to find that, with regard to the recommendation of that style of quarantine, there did not appear to be any difference of opinion in the Conference.

Mr. GODFREY THRUPP said it seemed to him that the consideration of the present aspect of cholera in Europe was really the re-consideration of the whole question of cholera itself, and was, in fact, one more effort to make the pieces of the cholera puzzle fit. Now, if the world were the box, then our facts in connexion with cholera were the pieces of the puzzle inside it, and the object in view was to make a picture for the lid of the box by fitting those

pieces together. Before attempting to do this we should say to ourselves, are the pieces of the puzzle perfect; that is, are our cholera facts complete? Now, there was only one man who had set up this puzzle, and was satisfied with the way in which he had done it, and that was Dr. Koch; the picture he made for the lid, after fitting the pieces together, was shaped like a comma, and labelled: "*Bacillus fons et origo mali, causa teterrima belli.*" Such being the case, it was of the utmost importance that the conference should first of all decide upon the correctness of the result which had been obtained by Dr. Koch. If, after examining the way in which the pieces were put together, they held that they did accurately fit, and, being accurately fitted, formed the picture of a comma-shaped *bacillus*, they had then to decide upon the value of the label: "*Fons et origo mali causa teterrima belli.*" This label meant that the puzzle was perfect. That all the pieces were there, and this was the label they warranted. The easiest way of getting a tangible result from such a conference as the present was, first of all, to decide upon the results already achieved by Dr. Koch; and, to do so, it was necessary that they should first answer the question: Is the picture of comma-bacillus the result of an accurate fitting of the pieces of the puzzle? If the answer was "No," then they should at once begin to re-arrange the pieces for themselves; but if the answer was "Yes," they were yet confronted by another question, the offspring of the first, though far more important, and that question was this: Did the pieces fitted together represent the pieces of a perfect puzzle; that was to say, had they before them the materials of a perfect puzzle, or had they only a sufficient number to make a section of the whole, the remainder being missing? For, unless the pieces which Dr. Koch had fitted into his comma-shaped bacillus were the pieces of the whole puzzle, he contended that the label stamped across them was not warranted, and that the label should not be, "Bacillus the cause of cholera," but, at the very utmost, "Bacillus the pathognomonic sign of cholera." It was upon this point he suggested that the

conference should express a decided opinion. Whether Dr. Koch was absolutely right, or only partially correct, or entirely wrong, there was no doubt whatever that he deserved the thanks of everyone, both inside and outside the medical profession, for he had bravely attacked the puzzle, and had openly and honestly said: "This is what I make of it, now what have you to say against it?" Mr. Thrupp thought it was quite time that they, as English representatives of the medical profession, should open their mouths and say something, and the simplest way to begin seemed to be by declaring either in favour of Dr. Koch, or by giving reasons for thinking that he was wrong. After they had given their reasons for believing him to be wrong, then would come the time for them to re-arrange the pieces of the puzzle, and there was certainly no more favourable opportunity than the present for doing this. Mr. Godfrey Thrupp personally believed that Dr. Koch had only shown that the cholera process was favourable to the production of a certain kind of bacillus, which, at the utmost, could only be looked upon as a pathognomonic sign of the disease.

The CHAIRMAN observed that he thought Dr. Koch was a very eminent, honest, and true man, but still he had taken up what seemed to be a somewhat narrow, though important, matter of investigation. Many medical men had their own opinions upon this matter, and were waiting to see a cholera *bacillus*. Dr. Koch—scientific man as he was—was sent to Calcutta with so little advice that he went to look for cholera at the wrong time of the year. The mere fact of the comma-like *bacillus* being found in the *excreta* and intestines of a person who had died from cholera, did not convince many learned gentlemen that the *bacillus* was the true germ, the specific cause of cholera, any more than the larvæ of the blow-fly in a decomposed animal would be considered to be the cause of the animal's death.

Dr. SQUIRE said no one had shown that cholera existed in France until last autumn, or the commencement of the spring. He noticed from some French journals that it was

the practice when vessels arrived at Toulon to thoroughly scrub them out and scrape them, the stuff being thrown into the harbour. This was done in the case of the *Saarthe*, on June 3rd, and four days afterwards, the first case of cholera occurred in a hulk named the *Montebello*, and from that time the cholera had gone on increasing.

Sir W. GUYER HUNTER said there was no evidence whatever to prove that the *Saarthe* was the means of bringing the cholera into France, and in support of his statement he read an extract from the report of the French Commission appointed specially to inquire into the matter. He also stated that the *Montebello* was a ship that had not left the harbour for more than a year. It was the opinion of Drs. Brouardel and Fauvel, and others, that the epidemic could not be traced to the *Saarthe*.

Dr. SQUIRE said that notwithstanding what had just been said, he was still of the same opinion, for it was proved that the ship left Tonkin, where the cholera was known to be, and upon April 15th a death occurred from cholera ; shortly after this vessel reached the harbour, and was cleaned out, the outbreak occurred.

Sir W. GUYER HUNTER pointed out that, after the last death occurred, the vessel was thoroughly cleaned and disinfected before leaving Cape St. Jacques, so that the cleaning of the vessel in Toulon could not be the cause of the disease.

Dr. LAWSON said every one who studied the course of ships, starting from India with cholera on board, knew that the cholera might last for a certain number of days and then disappear, and these ships might be traced to the end of their journey, but no single instance was recorded of any person being attacked. Still there were other ships which started upon their journey, and ten days or a fortnight after cholera broke out, and was carried along for a certain distance, but they had no information that any of these ships had introduced cholera to the place of destination. He understood from Dr. Squire that the last death from

cholera on board the *Saarthe* occurred on the April 15th, so that she passed through half of April, the whole of May, and a few days in June, without any trace of cholera being aboard. Judging that case by any other, he should say there was no danger of cholera. With regard to clothing, he was aware that in the year 1837, in the Mediterranean, thay paid not the slightest attention to disinfecting the excreta, or to separating people, for the excreta was poured in the usual place, but not a single case of cholera occurred. It was true the *Saarthe* came into harbour, and was cleaned out, as has been described, but there was no information as to how close she was lying to the *Montebello*. That, to his mind, was a most important question, for if the two ships were lying side by side, and people passed from one to the other, it would afford some evidence as to how the contagion occurred, but at present that evidence was not forthcoming.

Sir W. G. HUNTER said it appeared from the report to which he had before referred that the vessels were a considerable distance apart.

Dr. LAWSON said that at once answered his question.

The CHAIRMAN, in closing the Conference, thanked the gentlemen for their attendance, and hoped that good would result from the suggestions that had been made.

A vote of thanks, moved by Surgeon-Major PRINGLE and seconded by Dr. SQUIRE, was accorded to the Chairman for presiding.

SCHOOL HYGIENE

AND

SCHOOL CONSTRUCTION.

CONFERENCES BY THE MEDICAL SOCIETY OF LONDON AND NATIONAL HEALTH SOCIETY, FROM MONDAY, JULY 28th, TO SATURDAY, AUGUST 2nd, 1884.

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SCHOOL HYGIENE.

CONFERENCE ON MONDAY, JULY 28, 1884.

SUBJECT FOR DISCUSSION :—

1. "*School Dietaries.*" By FRANÇOIS DE CHAUMONT, M.D., F.R.S.

MR. BERKELEY HILL, in taking the Chair, apologised for the absence of Sir Andrew Clark, Bart., who had been summoned away. It was all the more to be regretted, as he knew he had prepared some important observations with regard to the subject about to be discussed.

SCHOOL DIETARIES.

By FRANÇOIS DE CHAUMONT, M.D., F.R.S.

Professor of Military Hygiene at the Army Medical School, Netley.

THE question which has been committed to me to start the discussion of is that of School Dietaries. This might be treated in several ways. I might describe the dietaries of various individual establishments, or I might start from a fundamental scientific basis, so far as we can, and state what ought to be the diet of children of a certain age so as to get the best results of health and work from them. I think it better to take this latter course, and to see if we

cannot find some fundamental principles upon which to go, and then other speakers can apply those principles or criticise them as may seem best.

The first point that we have to consider is how much material, stated in a scientific way, a child ought to have supplied to it. We must deal in the first place with the nitrogen, because that is the basis of the tissues of the body. Every tissue of the body, both solid and liquid, requires nitrogen for its building-up and repairing, and we know well enough that if we deprive men or animals of nitrogen, although they can hold on for a certain length of time, yet before long the waste of the body so much exceeds the amount of reparation that death is inevitable, and even when we diminish the amount of nitrogen without actually depriving the animal of it, we still find a considerable deterioration in the system, to which the body may indeed ultimately accommodate itself, but on a lower standard of health and efficiency.

Now to ascertain what amount of nitrogen ought to be given, we may inquire in the first place what amount do we find is transformed in the body in men in average health. The amount eliminated from the body in the form of urea is equivalent to something more than one grain per pound weight of body—about $1\frac{1}{8}$, or a little more. This is the quantity which is found to undergo chemical action when the body is in a state of perfect repose. If we applied this to the diet of children, we might of course take as a starting point an average weight, although it is difficult to apply an average to all the ages of children, because they are continually growing, or ought to be, up to the time that they leave school altogether. A child, for instance, of the age of seven would at the age of fourteen be double his former weight and bulk at least. But if we take what I think is a fair average of the weight of children, from 90 to 100 lbs., we may adopt this as a basis, and supposing that we could give about 1 to $1\frac{1}{4}$ grain of nitrogen for every pound weight of the body, the result would be about 110 to 111 grains of nitrogen in the diet. In addition to that we must add on

something more, because every healthy child takes a good deal of exercise either in the exercises that are prescribed for him in the work of his education or in playing various games. If we put the amount of work done in technical language at 100 foot-tons, and add 1 grain of nitrogen for each of those, that being about what is necessary, we should have as a result something like 220 grains, or thereabouts, as the amount of nitrogen which an average child ought to have. Of course this might be varied to a certain extent according to the age of the child ; a very young child would not require quite so much, but still this I think may be safely stated as an average. Now, working back from that average we find that that amount of nitrogen is represented by about 3 ounces of what we call water-free albuminate food in the day. Speaking of water-free albuminate food means the actually solid nitrogenous or flesh-forming matter that is present in the food of all kinds that is taken. We find it in meat, in milk, in eggs, in bread, and so on. There is a certain proportion in each of these, and taking the whole together we may put down 3 ounces as the basis to start from of actual water-free albuminates. I say "water-free," because all food we use contains a certain proportion of water ; butcher's meat, for instance, contains three-parts of water, and consequently there is only one-fourth actual solid materials, and out of that three-fourths, or four-fifths, according to the quality of the meat, is albuminate, that is flesh-forming food. This disposes in the first place of one branch of the inquiry.

Then, in addition to this, we require to provide a child with a certain amount of carbon, and also, I may add, with a certain amount of hydrogen. Those two substances undergo oxidation and produce the animal heat and energy necessary for carrying on work, whether it be mental work, or actual physical movement.

The question now is, How are we to calculate the amount of carbon necessary ? We may do it in this way by starting from the actual known facts, so as to make it as scientific as we possibly can. If we ascertain the amount

of carbonic acid given off by the lungs, we shall find a measure of the actual amount of energy which has been expended in producing that carbonic acid. When we are burning coal, for instance, with the aid of atmospheric air, which contains oxygen, we convert the carbon of the coal into carbonic acid, beyond which we cannot carry the oxidation. In doing this we produce a certain amount of energy which we can convert into anything we please. In the case of the locomotive engine it is converted into locomotion; in the case of the dynamo into electricity, and so on, and in the case of the human system it is converted into all the different functions of the body and all the movements we make of every kind whatever. We may calculate back the amount of energy which has been expended, and we find that, as there is an amount of carbonic acid given off equal to ·004 cubic feet for every pound weight of the body, we can then by weighing the body we have to deal with find the total amount in the 24 hours. This, I find, gives us, taking 100 lbs. as the average weight, a little under 10 cubic feet in the 24 hours. Now, one cubic foot of carbonic acid gives an amount of energy equal to 170 foot-tons; consequently, this amount gives us on the whole 1700 foot-tons of energy expended in the 24 hours. That is in a state of rest. Now, if we add on to this a certain quantity, say, 500 foot-tons for the growth of the child, which is continually going on, and 500 more for exercise and work done, we should come to a total of about 2700 foot-tons. This expression "foot-tons" means simply that the heat produced by the combustion of the carbon and hydrogen in the body can be converted into actual work, or be made to raise a weight, and according to the number of tons which could be raised in this way through one foot, or the number of feet through which one ton could be raised, we are able to compare one kind of work to another.

We then have this amount of 2700 foot-tons. We could also arrive at it in another way, because we find by experience that the actual amount per pound weight of energy

necessary for existence is about 17½ foot-tons, and multiplying it by 100 gives us 1750, then add on to this 500 for the growth, which would be 2250, an additional 500 for any work demanded, and we should have nearly the same amount, 2750 against the 2700. Accordingly, I think we may take that as the amount of energy which is required to keep a child, say of 100 lbs. weight, in good health and work.

Now, how are we to apply that to the arrangement of the other constituents of the food? We have already arranged for the albuminate food we require, and we must now try to discover how much fat and how much carbo-hydrates (starch or sugar) we should give to have a proper diet. We can calculate that in this way. If we ascertain the amount of hydrogen which is required in proportion to the amount of carbon, we shall find that about 420 foot-tons of the total amount of energy, representing 140 grains of hydrogen, would be provided for by the hydrogen. Then if we subtract from this amount of hydrogen the amount found in the albuminate food, we have a remainder of 116 grains, and this calculated out into the quantity contained in the fat brings us to about 2½ oz. of fat to be given daily, and this again is actually found by experience, getting it from another direction, to be a fairly good amount.

We have therefore now settled that there should be 3 oz. of albuminates and 2½ oz. of fat. Then the remaining carbon we have not already appropriated we divide by the number of grains contained in an ounce of water—free carbo-hydrates, either starch or sugar, which may be taken as an average at 190, and that brings us to about 10¾ oz. of starch or sugar; to which we must add 1 or 1½ oz. more, because there is always more or less substance contained in the starchy food that is indigestible and unassimilable; and that brings us to about 12 oz. of starch or sugar. To this we must add about ¾ to 1 oz. of salts, including not only the common salt which we take with our food, but also various other salts—phosphate of lime, magnesia, and so on—that are necessary for the building up of the body.

We have then, as a *résumé*, about 3 oz. of albuminate food, about 2½ oz. fat, about 12 oz. carbo-hydrates (starch or sugar), and about ¾ oz. of mineral matter. This, I think, would give a sufficient amount of energy and support to a child of 100 lbs. weight, say, for all ordinary and reasonable work. If we insist on feeding children too low, and demand too much work from them, the results are very much the same as we find in adults; as for instance in our prisons in this country, and probably still more in the prisons of India, where the question has been very carefully investigated by my colleague Dr. Lewis. The relation between food and work is shown to be of the most delicate nature, and so long as we demand work from an individual we must feed him accordingly. If we propose to take work out of him without the necessary food we shall not only get less work, but we shall produce such a deterioration in the individual as will ultimately render him incapable of doing any work at all. And the defects of insufficient diet are not merely temporary, for they not only incapacitate the individual for work at the time, but if prolonged produce a permanent injury. Some very careful experiments, made by Dr. Douglas Cunningham on the subject of the effects of starvation on plants and animals, especially with reference to the results of the last great famine in India, are full of the most instructive matter. He showed experimentally that even in plants, if you deprive them of proper nutriment, a change gradually takes place in the fibres of the plant: instead of the proper natural tissues of the plant little fatty globules begin to be deposited, the results of starvation, and ultimately the entire fibre becomes more or less destroyed; and that is a condition of things from which there is no recovery: that fibre or tissue is gone for ever. The same thing takes place in man when the amount of nutriment given is insufficient. If the conditions continue for any course of time these effects of inanition are shown; a certain portion of the tissue disappears by fatty degeneration, and is not restored. This is probably one of the causes of the small stature,

and the white stunted appearance of children who have been brought up in wretched circumstances, and have had insufficient food probably from their birth. Consequently the question of giving sufficient food is one of very great importance.

Then again, if we have a diet which is sufficient for ordinary purposes, but if we change the conditions and demand more work from the individual, the same result takes place, probably in a modified degree, but still in the same direction. This was a point which was shown very remarkably in the last famine in India, where the amount of food which could be given by the Government supply was not very large for an enormous mass of people, but it was sufficient to support existence in a state of rest and quiet. But some of the authorities, for what good reason it is difficult to say, thought it desirable to exact a certain amount of work from those unfortunate sufferers, and half a day's work was demanded in return for the food that they got. The result was that the line, which was a very narrow one, between starvation and existence was passed very rapidly, and the unfortunate people succumbed to this demand and died by thousands. For another instance I am indebted to Dr. Crerar, of the Royal Military Asylum, and it is a very instructive one. This school, which is otherwise known as the "Duke of York's" School at Chelsea, is an asylum which has existed for many years for the children of soldiers, and has always had a great deal of interest taken in it, and it has been the means of furnishing more than once very instructive matter, unfortunately at the expense of the young inmates. Some fifty years ago the condition of the school was very indifferent, both as to food and accommodation, and the death-rate was very high. My friend Mr. (now Surgeon-General) Balfour was then appointed surgeon of the school, and by introducing various reforms he improved the condition of matters very much. But still things were not as they ought to be, and the condition of the lads was by no means up to what one might have expected under the circum-

stances. One of the causes of the low condition of health was certainly the bad accommodation, in the way of badly crowded dormitories and insufficient ventilation. This was improved, and the consequent improvement of the children was shown in a very interesting way by a considerable increase in the average height and weight throughout the school. Then a change took place by the introduction of what is known as the half-time system. That is a system by which half the day is devoted to ordinary school-work, and the remaining half to labour in workshops and otherwise. This plan has been advocated by Mr. Chadwick and many enlightened sanitarians for a long time, and, when carried out in a proper, intelligent way, is an excellent plan and is for the benefit of the children. But unfortunately in this instance it seems to have been carried out in a way improper for the circumstances of the case. The children seem to have been called upon for an amount of work which was quite beyond their power, and certainly beyond the energy which could be produced by their diet. This was shown very curiously in the converse way by an immediate drop in the average height and weight of the children, and this continued during the time that the system was carried on. Dr. Crerar investigated these points very carefully, and found strong evidence that the amount of diet was insufficient for the amount of work to be done; and perhaps one of the most remarkable points about it as proving this was the large number of children that were put upon the cod-liver oil list. Out of some 460 children there were 60 or 80 that were getting cod-liver oil every day, and the reason apparently was, not so much as a medicinal remedy, but because these poor little fellows felt themselves hungry; they had not enough food, and they came really to get this oil partly for its own sake, but partly for the slice of bread and butter that generally accompanied it. A calculation of the diet showed that the amount of energy derivable from it was quite insufficient for the amount of work which was demanded. From data which Dr. Crerar furnished to me, I tried to calculate out

the amount of work the children were called upon for, and it was something like 200 foot-tons in the day, but the actual amount of energy supplied was not sufficient for more than 100; for instance, in the diet previous to the change which Dr. Crerar brought about, we find that the boys received about 2½ oz. of albuminates, 1·9 of fat, and 12·8 of carbo-hydrates (starch or sugar). Now I pointed out to you that we ought to have at least 3 oz. of albuminate and 2¼ oz. of fat, so that the boys were getting too little flesh-forming food and too little fat, and the amount of daily energy that was derivable from that food was only 2708 foot-tons, or an amount which I pointed out before was only equal to 100 foot-tons of work instead of about 200, as the boys were doing. The weaklier of those boys were sent down to us every summer at Netley Hospital for change of air, and the diet they got there was very different from the one they got before. They got 3·7 oz. of albuminates, 3·8 oz. of fat, besides carbo-hydrates, and the energy obtained from that food is equal to 4367 foot-tons, or an ample amount for everything required to be done. In the change which was proposed, and which has now been carried out in the Asylum, although all that Dr. Crerar demanded was not granted, yet still a very considerable improvement has taken place. We find now that the boys get 2·8 oz. of albuminates, 2·7 oz. of fat, and 13·3 oz. carbo-hydrates, besides salts over an ounce, giving a total of 19¾ oz. of water-free food, and an amount of energy which, although not quite so much as we should desire to have, is a considerable improvement, and I believe that the result has been very satisfactory in the improvement of the children, and is also shown by the fact that the cod-liver oil list has been practically abolished. The children now find they have enough food, and do not fly to the cod-liver oil for the sake of filling up their stomachs.

Those are the fundamental points with regard to diet, which we may take as the starting point. Then comes the question how those different articles are to be given, because we have been talking of the fundamental articles

of food, not articles of food as they are ordinarily met with. The sources of nitrogenous food, in the first place, are several. Meat of all kinds, eggs, and milk, are the chief sources, and in addition to those cheese, bread to some extent, and particularly peas and beans of all kinds. We may add, of course, all other cereals that can be conveniently used for food. Those different substances may all, more or less, enter into a diet and be applied with great benefit. Of course every diet must to a considerable extent consist of bread, and bread consists of a certain amount of flesh-giving substance, about 8 per cent., or thereabouts, and the quantity of bread generally given adds materially to the albuminate or flesh-forming food.* In the case of meat, the greater part of it is albuminate food with a little fat, but the most albuminate food of all is found in cheese, peas, and beans, and I think on the whole a more extensive use of those substances might be made in dietaries. The relative amount of albuminate food in cheese, for instance, as compared with meat, is very large. Meat of the ordinary kind has not more than 15 per cent., whereas cheese has more than 30 per cent., and peas and beans have generally about 22 per cent., which is much larger than even the very best meat ever contains; and, as they are very much cheaper, there is no doubt they might be made to enter very largely into the composition of the dietary. There is an objection which has been raised against the use of peas and beans, that they are not digestible, at least not so easily digestible as other things, and that is quite true; but here I think some change might be made in the method of cooking them. Mr. M. Williams has called attention to the great advantage that might be obtained by making both these substances, both animal and vegetable cheese, into an emulsion by the addition of alkalies, a little bi-carbonate of potash, for instance; digesting cheese or peas and beans in this produces an emulsion

* Other cereals may often conveniently replace bread, such as oatmeal and maize (Indian corn); both of these are useful, as they contain a larger amount of fat than wheat or any other cereal grain.

which is much more digestible than the ordinary material served in the usual way. It is not at all absolutely necessary in any dietary of course that we should get our albuminate food solely or even partially from animal food or meat. Meat is the most expensive way of getting albuminate food, but as it is on the whole very easily digested, and as it is generally acceptable to the palate, most people like it, and it enters more or less into the diet of all who can afford it. As regards the quantity of meat that should be given, if that is to be made an important source of albuminate food, then we must give from 6 to 8 ozs. at least, without bone, to each child, but this amount may be considerably diminished if other sources of albuminate food are employed. Thus, if cheese, peas and beans, and milk, be resorted to, the amount may be very well diminished, say to one-half. Another article that ought to enter very largely into the diet of children is, of course, milk, and this may be used either as it comes from the cow, or cooked in various ways, although it sometimes happens curiously enough, particularly amongst the poorer classes, that there is a positive dislike to milk, that is to say, milk taken in the ordinary way; but, generally speaking, if it is used in cooking, in the making of puddings or articles of that sort, it is taken with considerable relish.

Then, another point of importance is the amount of fat to be employed in the dietary. A deficiency of fat is a fault that runs through almost all dietaries. We find in the rations for our soldiers, rations in prisons, and in all places where what we may call a corporate diet is arranged, fat falls deficient; instead of having for an adult man about 3 ozs. of fat, which he ought to have, in most of these cases he has little more than one-third. Now, fat is especially necessary for children in some form or another. Some children at certain ages will eat a great deal of fat in almost any shape, at other times they take a dislike to it, which is a certain indication it is not required so much as when they take it with a relish, but at any rate a certain amount ought to be given in the most digestible form. There is no

doubt that the most digestible form of fat is good butter, but that is unfortunately rather expensive, and therefore it must be supplemented in other ways; dripping, suet, and various other forms of fat may be employed to aid the diet so as to get enough fat for the purpose of health.

Then the remaining article, starch or sugar, is seldom wanting in diet; generally, indeed, there is too great a preponderance of starch over the other articles to be usefully dealt with. In the case of starch, if an excess is given, the practical effect is that a considerable portion of it is unconverted in the body, and therefore is simply waste, and may act as an irritant; but in the case of children of the age I have referred to, about twelve or thirteen ounces of carbo-hydrates (starch or sugar) is quite sufficient for ordinary health. This starch is given, of course, very largely in the form of bread—there being in bread nearly 50 per cent. of starch, and in the form of potatoes—a large part of the solid matter of potatoes being starch.

With regard to the question of salts which enter into diet, a large portion is the salt which we take, either cooked in the food or that we add to it. That is absolutely necessary for the purpose of digestion, and also for the purpose of elaboration of the fluids of the body and building up the tissues. Other salts, however, such as phosphate of lime and magnesia, are requisite for the keeping up of the bony skeleton, and these ought to be obtained partly from meat and partly from bread. On this point I may refer to the question which has been considered a good deal of late years, as to whether we have not made a great mistake in insisting too much on a very white bread, and by that means getting rid of a certain quantity of the nutrient materials. Of course the whiter the bread is the greater is the proportion of starch, and the smaller the quantity of the other ingredients; and there is no doubt if we deprive ourselves of these ingredients, which consist very largely of phosphates, and to some extent of fat, our system will suffer unless we take in those substances in another way. The other day I analysed a

sample of flour myself in this Exhibition which seemed to be an excellent sample, so far as the amount of gluten or nitrogenous matter went, but from the results obtained I found that something like 40 per cent. of the fat of the flour was deficient, and something like 60 or 70 per cent. of the mineral matter. An examination with the microscope showed that this was a flour which had evidently been deprived of its external envelope to a very large extent indeed, and that thus had been lost those ingredients which are decidedly useful for the body. The plan which has been proposed and tried by the Bread Reform League certainly seems to commend itself for practical use—that of removing with care only the external, outer envelope of the wheat, and so retaining the internal portions, which abound in the articles I have mentioned. The difficulty hitherto attending the making use of whole-meal bread has been the getting rid of this external envelope, which consists very largely of silica, and would be very irritating to the mucous membrane of the stomach and the alimentary canal. But I believe that this point has been successfully solved by the new method of decortication, and a meal is now produced which retains in the highest degree all the constituents of the corn itself without retaining the irritating particles of the external envelope; and certainly bread made with this would be more nutritious than bread made with the ordinary best white flour. This is a point that I think ought to occupy the attention of all who have to do with diet, especially in the case of children.

That there is another class of substances which ought not to be neglected, and that is the class of vegetable acids, contained in citrates, acetates, tartrates, and so on. Those are absolutely necessary for health, both for children and adults, otherwise the condition of the blood becomes changed, and we have symptoms which are known as scorbutic. The disease called scurvy in its severest form is very terrible, but the milder forms of it are undoubtedly present in many cases, although unobserved, and tend to complicate all sorts of maladies by arresting and prevent-

ing the growth of the individual. Therefore vegetable food ought to enter very considerably into the diet of children; and these vegetable salts are to be found in most succulent vegetables which are ordinarily used. An ample supply of potatoes, varied with other succulents, and ripe fruit whenever it can be obtained, are all to a certain extent essential and highly desirable in all dietaries.

The next question which presents itself is that of variety of food, and this, I think, is not less important than the articles themselves and the quantity. We know very well that if a monotonous diet is given, even hungry people turn away from it. We had that experience in the army for many years. When the soldier entered the army in former days, he knew that for the next twenty-one years of his life he would dine every day off beef and broth, without any change all that time. Some people might say he was very lucky to get beef and broth, which is quite true, but at the same time, with so much monotony of diet, the men often left their rations, although actually hungry, because they could not stand the perpetual sameness. The same thing has been found with children too. In the experience of the "Duke of York's" School, which I have already referred to, this was found also; even when the children were having a diet which was insufficient for them, yet the monotony of it was such that they very often left their food, and when the change was proposed to increase the amount of their food, one of the arguments used against it was, what was the use of giving them any more when they left what they had? The answer was plain: if you give it to them in a pleasant agreeable form they will eat it, and they will eat more, and the proof of it is, that, since the diet has been improved and varied, they have eaten the increased diet with a relish and shown that they have benefited by it. The desire of some change from a monotonous diet is a very powerful one always, and I remember meeting with a very curious instance of it very many years ago when I was quartered in the Isle of Wight. There was then at Parkhurst a prison for juvenile delinquents, and I

remember the surgeon of the prison, Dr. Dabbs, telling me that he was a good deal troubled by the boys repeatedly reporting themselves sick, and on observation and inquiry he found that the reason was that they really were so tired of the monotonous food that they would take any physic as a kind of relish. He tried to choke them off by giving them the bitterest and nastiest things in the Pharmacopœia, but it did not seem to be of any use. They took it just as people take a glass of bitters before dinner, and the only way he found of stopping this practice was by giving them a slight dose of nauseating medicine, which made them feel a little sick, so that they could not eat their food, and that prevented them coming up again in the same way. That was an example of how the palate desires variety, even if the variety be of a very uninviting character. Another point of importance is, I think, the way in which meals are distributed in the day. Very often although the quantity may be sufficient, yet the diet errs in being given at too long intervals, too few times in the day. This is an error. We ought to remember that the tissue change in children is rapid and digestion is rapid, and food must therefore be given at regular intervals, and not too long between. In the first place, with regard to breakfast, I think it is a great mistake to call upon children, or indeed upon anybody, for much work before breakfast. I think that as soon after a child gets out of bed as possible, and compatible with the arrangements of the establishment, he ought to have his breakfast. I think that if work is demanded on an empty stomach the work will never be well done—and it will always be to the disadvantage of the individual. Then the dinner-hour is generally some five hours after the breakfast, and the supper, or tea-hour, is some five hours later than that; and then there is a long interval of twelve or fourteen hours when there is nothing at all. Now this is a wrong principle. I do not think any child ought to be left more than three hours at the outside—2½ would be better—without food of some sort. Therefore, if the child has breakfast at 7, and dines at 12, he ought to have some light

refreshment between, which need not be a very substantial meal—a piece of bread and a drink of milk would answer the purpose thoroughly—so as to take away the feeling of craving which all children have when there is a long interval between meals. Again, the same thing should be done in the afternoon. In that way the children would feel comfortable and fit for any work demanded of them. In the case of the "Duke of York's" School boys who came to Netley, we gave them, after the dinner-time at half-past 12, a first supper, as we call it, at 4 o'clock, consisting of bread and butter, milk, and a slice of cheese, and then a second supper at 7 o'clock, of bread and butter and milk. By that means they got on very well, and seemed to thrive and to relish their food.

I do not propose to go further into detail on this question —it would be possible to take up the diet of individual schools, and go into much detail, but I hope I have laid before you the foundation of the question, and upon that various systems can be built, which may be applicable to different individual cases.

DISCUSSION.

Dr. F. J. MOUAT (who had taken the chair in succession to Mr. Berkeley Hill) then invited discussion on the practical part of the question, particularly the variety, the sufficiency and other conditions of food suitable for children. He remarked that childhood was the most critical of all ages, being the time when the structure of the individual was being built up, and it was important to consider the individual constitution of different children and their origin. His experience in this country with regard to the dieting of children had been confined almost to those of the Poor Law schools, a very numerous and interesting class; and scarcely a day passed without some question or other connected with the regulation of their dietaries coming before him. By an application

of the principle which had been so clearly demonstrated by Professor de Chaumont, and which was known to him many years ago in the writings of Sir Robert Christison, Sir Lyon Playfair, and others, who then wrote very ably on the subject, he had been able he believed to effect a considerable amount of good in dealing with the unhealthy structures which they had to build up in those schools. In these matters practice was more important than theory, and he hoped the gentlemen and ladies present would give the results of their personal experience.

Dr. MILNER FOTHERGILL said though he had no children of his own, that did not prevent his taking a deep interest in children, and in the very important question of feeding them during the period of growth, which unfortunately was at the same time the period of education. It would be eminently desirable in every way that the education of the child should be delayed until it had attained its full stature, not merely in height but in breadth—the only objection to that was that it was simply impossible. The best work of life was not that done at school; it was the education of the individual after complete stature was attained. Professor de Chaumont had covered so much ground that he scarcely knew where to start, but what he had said about the necessity of fat for children was an important matter. They all knew that at the present day children loathed fat. How these litttle fellows came to get that dislike he could not tell; he used to believe it was a case of want of a birch rod, but he found that was incorrect in this way. One of his friends, an eminent man of science, and as little dainty and fastidious in his food as any one, used to come home when a bachelor for a beefsteak; at ordinary times he could eat the fat, but when he was very tired he cut off the beef fat and ate butter with it. The fact was when he was tired he could not digest the comparatively indigestible beef fat. This circumstance made him look further into the question, and the more he looked into it, the more he began to realise that many children could not eat fat in what was commonly called "a dollop." If you gave them a nice slice of sweet

fat, they would leave it on the plate, and he was informed by persons who kept schools for delicate children that it was a very common thing to find a child reject this beautiful sweet fat, and then go after meal-times for a dose of cod-liver oil. The fact was the child could digest one fat but not the other. The question was, how to give fat to children, and in a way which would not set them against it. One thing he should recommend was, in the preparation of milk puddings for the nursery, to take the skin off the milk when hot, and to stir in a considerable quantity of butter. It mixed very easily with the milk pudding, and was readily taken, or the pudding might be eaten with butter and sugar, particularly if it was cold. The value of peas and beans as regards carbo-hydrates and albuminates had also been referred to, and the most pleasant form of taking them with fat was, for an adult, peas or beans with fat bacon, but children could not eat that. The cheapest and best form that he knew of was the baked beans of New England, which were imported in tins; he knew there was a prejudice against tinned food, but, in his opinion on this point, you find a combination of carbohydrates, albuminates, and fat such as you could not get anywhere else for the same money. Again, with regard to milk, some time ago a Government inspection took place into the condition of the factory children in Lancashire and Yorkshire. Dr. Parkinson Burden, who had long paid attention to this matter, published a series of articles showing the enormous improvement in the children when milk was added to their diet. These poor unlucky children were fed with tea without milk, with bread made from flour deprived of some of its nutritious qualities, and perhaps a little butter or dripping, and of course the child was puny, stunted, and its intelligence was limited. The brain required a particular kind of food, which was a phosphorised fat, and unless this was given to children they did not thrive. If you compared with these poor, stunted factory children those who lived on the seaboard, especially in fishing neighbourhoods, where they got plenty of phos-

phorous and plenty of fat with their food, it was found they were not only well grown for their years, but had quite the average amount of intelligence.

Dr. ROBERT PRINGLE said he was one of the first who began experiments on diet in the prisons in India; the men were weighed very regularly, but they soon gave up the experiment, for the hospitals got filled. The reason was that the diet scale was calculated upon what was met with outside, but a man who was free and his own master would do just as much or as little work as he chose, and in the case of natives when not carefully supervised that was not much, as they were in the habit of sitting down and meditating a good deal. That was very different to men standing in a long line with an overseer to keep them hard at it. In the Agra gaol there were 2000 or 3000 men who were kept working at high pressure, but their diet was calculated at a little over what it was outside, and of course these poor people lost flesh terribly. Now to apply that to the case of children in schools: since he came home from India, having been away ten years, he found all London covered with schools—fine large buildings, which no doubt were well ventilated; but still there was a great difference between a child inside a school and a child outside. There were certain things called brain power, brain waste, and brain energy, and they must be supplied by something. If a boy had to work with his brains you must keep up his system in some way or other, and unless a boy were well fed you could not get much work out of him. To show the result of insufficient diet he might mention a circumstance that was not perhaps generally known. When on one occasion he returned to India after a furlough he met an American on board, who asked him if he remembered the Aztec children. He said, yes; they came from Mexico; but this gentleman told him they did nothing of the kind, they were famine children from Beloochistan—specimens of a species raised by starvation. Children required good food for the development both of the mind and body. With regard to wheaten flour he quite agreed with what had been

said. There was nothing young horses throve on better than a good quantity of bran. In India horses were fed on peas, but they gave them bran also, which supplied exactly what was left out in most of the corn-flours which were made, namely, the phosphates. But one thing had not been alluded to which he found of great importance in India; there was often a capricious digestion, and he found that the soldiers often had too much butchers' meat, and not half enough exercise. The sickness amongst the infantry was far greater than amongst the artillery and cavalry, because the artilleryman had to get up and groom his horse, whilst the infantry man had nothing to do but to clean down his rifle, and then he had done. He did not think children in this country got enough soup; if they had too much meat it was most exhausting to the gastric juices, and he found that by adding a little soup the meat was more easily digested. Some children did not like vegetables, but they could easily be given them in the form of soup, and, as a Scotchman, he thought there was nothing like good hotch-potch.

A LADY said there was no doubt that many children did not take sufficient vegetables, and that good soup was in her experience very beneficial to them above the age of four years.

Mr. BOUSFIELD, of the London School Board, regretted, that Mr. Marchant Williams was not present, because he, as one of the Inspectors of the London School Board, had given a great deal of time to the question of the way in which children attending the Board Schools lived at home, and the information he had collected would have been very valuable. Since he had himself been a member of the Board he had taken some pains to ascertain the way in which children fed in the middle of the day, and he found there were many of them who were unable to go home from school, and who brought their food with them. On inquiring what that food was, he found in a large number of cases it was entirely insufficient, and of a character which would not supply proper nutriment. In very many schools, particu-

larly if there happened to be a cold-fish shop in the neighbourhood, the children were very much in the habit of buying a pennyworth of fish, which formed their entire meal; many brought simply bread, but as a rule they brought bread with a very small modicum of dripping, or in some cases a small piece of cheese, and in very few or rare cases a piece of bacon or meat. Now all who had much acquaintance with the larger elementary schools in the poorer parts of London must feel that the question of food was very important, that a great number of these children showed every sign of not having sufficient to eat, particularly considering the work they had to do. Within the last year a number of attempts had been made to give dinners to these children at a cost within their means, viz., a penny; for those who had to deal practically with these children must know that a penny was about the utmost that a large number of them could pay. He held that it was not the function either of the School Board or the State to supply these children with food at the cost of the ratepayers, and therefore it became an important question to see how far it was possible to bring adequate and good food within their reach at such a price. The Rev. Stephen Fuller some time ago made some experiments in this direction in Finsbury; he got from Dr. Carpenter what he considered necessary for a child's dinner, and provided a number of penny dinners in a very crowded locality. The experience of some months tended to show that at this price it could be made self-supporting, and he had himself, in conjunction with two ladies, been trying the same thing in Chelsea. Fortunately he had the help of a lady who had been trained in the School of Cookery, and they had been drawing children from several Board Schools and voluntary schools in the neighbourhood. They gave a variety of foods: roly-poly pudding with jam and currants, Irish stew, beans and bacon, stewed meat with vegetables, stewed meat with macaroni or lentils, as well as bread, and bread and jam; any of these were given for a penny, the amount being practically as much as a child can eat. His experience,

like that of Mr. Fuller, was that it could be made to pay expenses, including rent, labour, and fuel, providing only that the numbers were sufficient. If it could be done in one place it could elsewhere, and the ladies he had mentioned were going after the holidays to start some other centres in which similar dinners should be given. It was found that with less than 200 it did not pay expenses, but with that number or over it would, and he hoped therefore the scheme would be extended.

Dr. ALDER SMITH, Medical Officer of Christ's Hospital, said they had in that institution 800 boys in London, and some 400 in the country, so that he had practical experience of some 1200 boys for the last fourteen years. The great difficulty in feeding children was the expense. If one multiplied 40 weeks by seven, and then by 1200, it would be found that an extra expenditure of one penny per head per day would come to over £1400 in the year. For many years past he had been trying to get additions to the dietary, but that was the difficulty he always met with; if he wished to spend one penny per head per day it meant £1400 a year, which again meant 30 or 40 boys less in the school. Then there was the difficulty of children refusing their food; if anything novel were introduced in the way of experiment, one or two of the head boys would say: "I do not like this"; and it would pass down the ward, and no one would touch it. They had tried tinned meat, and he had seen 50 boys refuse it; different soups also had been tried and had always been a failure; as far as he had seen, they would have good solid food and meat. When he first went to the Hospital they used to have a quarter of a pint of milk in the morning, and in the evening sometimes a quarter of a pint, and sometimes beer; but since he thought that in a school no money ought to be spent on alcohol in any form, they many years ago did away with the half-pint of ale three times a day, and now they had a half-pint of pure milk in the morning, and a half-pint in the evening, except sometimes in the winter, when they had as an alternative cocoa made with milk. With regard

to bread, they used to deal out so many ounces to each boy, some took more and some less, and there was great waste; but some years ago they adopted the system of having a comparatively small piece of bread cut for each boy, though they could all have as much more as they pleased either at dinner or supper. He found boys often got faint in the morning, and then he allowed them to have a slice of bread at six o'clock. Those who sat up to work beyond half-past seven—perhaps from one-third to one-half the school—had bread and cheese for supper. The ordinary diet for breakfast was a half-pint of milk or cocoa, about 1 oz. or 1½ oz. of dripping and unlimited bread; it was not white bread, nor whole-meal, but somewhat brownish. At dinner 4 oz. of cooked meat free from bone, a half-pound of potatoes, bread and greens, and now and then Yorkshire pudding, which was not very expensive; the boys liked it, and it was made with a good deal of fat. For tea or supper there was a half-pint of milk, unlimited bread and 1 oz. of butter. They had also lately introduced a greater variety: occasionally, fish, rabbits, and sometimes veal, and there was a good deal of variety in the way in which the meat was cooked. Beefsteak-pie was also a favourite dish, as was soup with meat. A certain number of boys who were delicate had what was called "extra breakfast" to tickle their appetite, and he believed that did them a great deal of good. There was always a great difficulty about getting the requisite quantity of fat into children's diet; dripping was very good, but they did not like it. Another point of great importance was the way in which things were cooked and served, for he was sure many children would take more food if it came up better served.

Dr. MARTYN said that besides the material of food a great deal depended on the treatment. Bread-stuffs, of course, were of primary importance, but he doubted whether bread was the best form of giving bread-stuffs. The effect of fermentation was to lower the nutritive value of bread, and one could not maintain life on bread for an unlimited time. He thought the form of biscuit would be infinitely

more sustaining, and also valuable on other grounds, for the various functions of the digestive organs must be kept in mind. In his opinion it was very important that the food supplied in early life should not be in the shape of soups and soft things, but in a rougher condition, in order that the masticating organs should be properly exercised. He had shown in a paper which he had read elsewhere that this function, properly carried out, tended to develop and preserve the teeth. Bread-stuffs in the form of pastry were also very good, and cakes raised without yeast. The effect of yeast on flour was to reduce it to a condition to very nearly approaching starch, because the gluten was broken up; and he thought it was the most wasteful form of presenting bread-stuffs as a diet. With regard to nitrogenous matter, many vegetables supplied nutritive principles in an even larger proportion than meat; and it must be remembered that large flesh-eaters were short livers, and the continued consumption of considerable quantities of animal food had the effect of inducing certain disorders.

Dr. NICHOLLS said that there had been considerable reference to experience, but none of the speakers had given their own; he would give the result of his experience as well as observation. The first diet which he partook of, although he did not recollect it, was milk, which they were told contained all the materials which were necessary, and it might safely enter more largely into the diet of children at schools. As to fat, it was greatly to his disgust in early years to be asked to eat fat, but there was one form of fat or oil which was so necessary that he never knew a boy to refuse, namely, nuts, which seemed to him the natural food of childhood. Nuts could be produced in this country and in all countries in great abundance. They were the favourite food of all children, and by eating them they would get the fat which was so necessary for them, and it would support their activity and give them the force and strength to carry out the muscular exercises to which all were prone. He would have nuts employed, not now and

then as a luxury, but as a regular part of the diet. Then certain classes of fruit were very valuable; millions lived for months every year upon dates alone, which could be brought to this country extremely cheap, and they were an admirable diet for children at school or anywhere else. Again, Humboldt stated that thirty persons could be well fed upon an acre of bananas year by year; and if the demand were larger they could be brought to this country much cheaper than they were at present. They were so perfect a food that thousands of persons on the island of Cuba lived on them alone, and did the hardest work, the ration being nine bananas a day. Another article which could be brought here very cheaply was Indian corn; this contained a large quantity of oil, as well as all the other necessary ingredients of a perfect diet; with it you needed no butter. Another thing which he had never seen children reject, and which, though it did not supply oil directly, was convertible into it, was treacle or molasses; and this ought to enter largely into children's diet, for they were naturally fond of sweet things. It seemed to him that if people would study the tastes of children and their aptitudes and natural instincts, and give them those things which they relished, they would have all that was necessary to make strong and healthy children, fit for their play or their studies.

Mr. MARSHALL said he had been medical officer for thirty years to some industrial schools at Mitcham, containing some 500 children. With regard to the question of introducing fat, he was surprised that no one had referred to the manner in which it could be given in suet pudding, which he found one of the most favourite forms of food. A small quantity of suet could also be introduced into rice and milk. The diet generally adopted was a mixed one: meat four times a week, soup one day, cake and milk in the morning and evening. The younger children under six had nothing but pure milk, which they procured from their own cows. With regard to bread, they had lately had a bakery erected, and were now supplying the children with bread

made on the premises. They had the outer portion only of the grain removed. As to the health of the children, they had had the usual amount of contagious ophthalmia, which was now reduced to a minimum, and also the average number of skin affections, but the general health was very good. They had plenty of vegetables grown on the farm, principally of the cabbage tribe, with rhubarb, and other things of that kind.

Mr. NOBLE SMITH said he should be glad of some further information on the question of children working before breakfast. There must be some present who had had practical experience as to the result of working or not working, and he thought it would be valuable to have a decided opinion upon this point. He was frequently asked about this by ladies who had the management of young ladies' schools, for, however it might be with boys, he believed it was very much the custom in girls' schools to do a great deal of work before breakfast, and sometimes it was thought they suffered in consequence. Probably it would depend very much on the question of supper the night before, and how many hours were spent between supper and breakfast. If young delicate girls had to get up in the morning, say at six o'clock, and sometimes earlier, and do an hour or an hour and a-half's work before taking any food, it seemed to him only reasonable to suppose that they must suffer.

Miss WILLIAMSON said she had not found that girls suffered much from working before breakfast if those who were delicate had the opportunity of getting something to eat. She had a great many girls under her charge, and they all did about an hour's work before breakfast, and she did not find they suffered, or that any one asked for anything except those who were really delicate. They were supplied with milk and bread and butter, and any one could have it who wished. They came down at seven, and at eight had a very substantial breakfast. They had supper at eight o'clock. In reply to the Chairman, she said the ages were from eleven to twenty.

Mr. STATHAM said the children came to the Foundling Hospital at the age of three or four years, and remained until they were fourteen or fifteen. He cordially agreed with all that had been said about variety of diet, and their practice was to vary it in a slight degree. They gave them vegetables, and stewed fruit; chiefly rhubarb, in the summer. He should like to know what the opinion was with regard to giving beer to children. He gathered that Dr. Alder Smith did not approve of it as an article of diet, but their practice was to give beer to delicate children, and they found it answer very well, especially with those who were of strumous habit. Some work was done before breakfast, particularly in the summer, when they got up about six and breakfasted at seven.

Dr. MARTEN said he had no doubt that a person was in the best condition in the early morning, when the body had been at rest, and the brain had rested too. There was not then that condition of exhaustion in which work could not be done. One observation he had intended to make before was that salads should enter largely into every diet, as supplying those antiscorbutic salts so essential to health.

Mr. RICHARDS remarked that in all the dietaries he had seen for industrial schools under the Poor Law, though the diet was varied for each day of the week, the weeks went on the same all the year round; if they had suet pudding on Wednesday they had suet pudding every Wednesday for the whole year, and that could hardly be called variety. Again, the dietary was exactly the same for the summer months as for the winter, which physiologically was not correct. The matron of an industrial school gave him an instance showing how children required variety. She said very often when they had a good dinner set before them they would not take it—perhaps they had it on the same day of the week for several years—but they would immediately go out into the yard, and if they could get to the pig-tub, where all sorts of things were mixed up together, there they would take an appetising meal.

Dr. LEVER, Medical Officer of the Military College at

Oxford, said the boys there did a kind of work before breakfast, but not head-work ; they always went out to drill before breakfast for half an hour, after which they went to church. He never found any ill effects whatever. Any boy who wished to have food before breakfast could obtain it. With regard to fat, bacon was an article which had not been mentioned, but he thought nearly all children, if they had teeth to eat it, were very fond of bacon, and it was a very digestible form of fat. Eggs also were very useful.

The CHAIRMAN said the discussion had been very interesting, and many important practical facts had been brought forward. Before proposing a cordial vote of thanks to Professor de Chaumont for his admirable paper, which had entirely covered the scientific aspect of the question, he would make one or two remarks on some matters which had been incidentally mentioned. First, with regard to the dietary of one class of people of whom he had for fifteen years an average number of 20,000 under his control, namely, the prisoners in India. He would say that thirty years ago, when he first joined the Army Medical Department, he found among the prisoners a large proportion of disease which he traced undoubtedly to the insufficient and improper food. He reported the matter to the Government, and, with the cordiality with which the various Governments in India listened to the representation of its officers, he was directed to institute a minute and searching inquiry into the question. The first step he took was that of ascertaining what was the ordinary food of the labouring free population of every caste and class amongst the sixty millions of people with whom he had to deal, and when he gathered together the information he constructed dietary tables to show the conditions of the different populations, for they varied in the most extraordinary degree, from naked savages who lived on fruits and roots up to some of the most civilised people he had ever come in contact with. The dietary tables he constructed were strictly on the principles laid down by Dr. Christison and Dr. Playfair in those days, which

Professor de Chaumont had so excellently laid before them that day, the dietary being varied according to the habits of the people in the various provinces. Having constructed that scale, he obtained the sanction of the Government to it, but he sent round a circular to every officer serving under him, bringing to their notice that the condition of a prisoner was very different to that of free men—that he was labouring under depressing and other influences, deprived of all variety, and the solace and comfort of liberty, therefore a dietary which might prove sufficient for a free man might be insufficient for one in prison. He therefore directed, that the instant a prisoner engaged in work exhibited signs of failing health, he should be weighed, and if he were found to be losing weight his food should be increased until his appearance was restored; that the fixed diet which was sufficient for the majority should not be insisted upon for the minority who pined under it. That dietary lasted a considerable number of years, until he left the province. Then there succeeded to the Government a gentleman who thought much too great attention was paid to the sickness and mortality amongst these prisoners, and he determined to make the dietary in some degree an instrument of punishment. The result was disastrous, and it was in consequence of this that the investigations to which Professor de Chaumont had drawn attention were made, but he could tell them that privately, outside those investigations, information was sent to him that in two of the principal prisons the remonstrances actually sent in to the Government were so great that the dietary was altered, and the health of the prisoners restored; and he believed that the dietary in force now, sufficient to maintain health—for anything beyond was a luxury denied to prisoners—should be given in all cases, and that the result would be most favourable in improving the health and in diminishing the death-rate. Besides that, he had some personal experience of the Orissa famine; he was absent from India at the beginning, but he returned and resumed charge of his jurisdiction

towards the end of it. He saw there some very strange and sad sights; and, as showing how infinitely valuable and how absolutely necessary variety of food is, and a large element of vegetable food, to children of all ages, he might mention that the Orissa fishing population, although they had an ample supply of fish, died of absolute starvation, having no vegetable food to mix with it; the effects of famine were as strongly evidenced in them as in those who were altogether deprived of food. On another occasion he had to visit a gaol fifty miles from Calcutta, and when he went into the prison in the morning he found a large circle of unhappy skeletons, perfect scare-crows, miserable-looking objects, sitting with bowls in their hands waiting for the water in which the rice given to the prisoners was boiled. That was all the food they had, but it maintained their lives because the nitrogenous constituents of the rice were washed out, the carbonaceous remaining in the food of the prisoners, who had condiments with it; and these people lived on that alone for many weeks until the Government were able to supply them with food. With regard to the dietary of children, he cordially agreed with everything which Professor de Chaumont had said from the purely scientific point of view. His experience latterly had been with the children of the poor; he declined to call them pauper children, for they were not responsible for the position in which they were born; they were not the authors of their poverty, and he preferred to call them, as they did in Holland, "the children of the poor"; and, with regard to these schools, of course, the dietary had necessarily to be constructed on economical principles. The principle underlying it was that the man who had become a pauper should not be put in a better position, either as regards food or anything else, than the free labouring population outside, who by honest industry managed to keep off the rates. But it was very difficult to combine strict economy with a sufficient amount of nutritious food. One of the greatest difficulties he had frequently to contend with was to convince those who

had charge of the children that an agreeable and varied dietary was as necessary, and more necessary, for these children than for those born in better circumstances, whose original material was better to work upon. Therefore, as far as it was in his power to secure it, he aimed at getting variety of food, a sufficiency of food, and food given at proper intervals, regulated according to the ages of the children. The four ages for regulation of dietary were first up to two years; during that time they were under the charge of their mothers in the nursery and of the medical officer, who could give them anything he considered necessary. Then they began to pass into the schools; from two to five there was a more ample dietary, in which meat and other things now began to enter rather more largely, he thought, than formerly, because one of the best authorities he knew on the subject was the late Professor Letheby, who had divided them into the following ages—two to five, five to nine, and nine to sixteen—for dietetic purposes. The dietary increased in quantity, but did not vary in quality, for these three classes. For the latter, from nine to sixteen, the diet was on exactly the same scale as for able-bodied women, and it was an ample scale when fairly carried out. They endeavoured also not to provide a strictly winter and summer dietary, but to make some change; there were, however, very great difficulties connected with the keeping of accounts, and a multitude of other collateral matters which had to be considered in these questions quite irrespective of the main issue, namely, the amount of actual food given. Scarcely one of these workhouses but had a large garden attached to it, and practically there was an unlimited supply of fresh vegetables in the hot season of the year. He could now point to some large schools in which there was scarcely any death-rate, in which the standard of health was extremely high, and in which physical growth was improved, and the children were now able to enter the navy and follow other pursuits which were impossible to them when the dietary was scanty and insufficient. Whenever it was found

in any of these places that any skin disease or ophthalmia, or any of those diseases which depended to some degree on insufficient or improper nutrition, was discovered, it was immediately investigated and, if necessary, a special diet authorised. As far as the Poor Law administration was concerned, every care was taken to convert their very bad raw material into good stuff for after life; and one of the most efficient instruments for this end was undoubtedly food. It was in the power of the medical officer of every institution to change the dietary of individual cases where he considered necessary, so that an amount of care was practised in these institutions worthy of imitation elsewhere. He felt bound to say that in scarcely any secondary schools in this country would be found the same intelligent attention paid to the subject, or the same liberality as was shown by Boards of Guardians in dealing with this question when it was brought properly to their notice. He concluded by proposing a cordial vote of thanks to Dr. de Chaumont, which was carried unanimously, and the Conference adjourned.

Conference on Tuesday, July 29, 1884.

THE EFFECTS OF MODERN SYSTEMS OF COMPULSORY EDUCATION AND COMPETITIVE EXAMINATION ON THE MENTAL AND PHYSICAL HEALTH OF THE COMMUNITY.

The Conference resumed its Sittings on Tuesday, July 29th, 1884, when ARTHUR E. DURHAM, Esq., F.R.C.S., President of the Medical Society, took the Chair.

SUBJECTS FOR DISCUSSION:—

2. "*The Effects of Modern Systems of Compulsory Education and Competitive Examination on the Mental and Physical Health of the Community.*" By J. PRIDGIN TEALE, M.B., M.A. (Oxon), F.R.C.S.
3. "*Overwork in Schools.*" By R. BRUDENELL CARTER, F.R.C.S.
4. "*Punishment in Schools: Notes on some of its Methods and Effects.*" By CHARLES EDWARD SHELLY, B.A., M.B. (Cant.)
5. "*Home Lessons after School Hours.*" By Sir JOSEPH FAYRER, K.C.S.I., M.D.
6. "*Over-pressure in Elementary Schools.*" By RICHARD GREENWOOD.

IN commencing the proceedings, the Chairman said there could be no room for doubt or question that the subject-matter for discussion that day, viz., "Over-pressure in Schools," was fraught with very grave importance and the deepest interest, nor could there be any doubt that the various topics included under it were such as gave scope for great diversity of opinion; but he hoped it would be possible to arrive at some definite conclusion as the result

of the discussion. With regard to the present system of school education, there was much reason to fear that it was detrimental to a certain extent, but was beneficial otherwise, and the present arrangements were regarded by a great many with a considerable amount of alarm. On the other hand, there were some who considered that things were not so bad as they were represented; that the mischief which was feared and regarded as actual did not exist at all, whilst others again considered the present system approached very near to perfection, and only required to be carried a little further in order to reach something like actual perfection. It was obvious that if such differences of opinion existed, they might arise from the want of information on the one hand, and the want, on the other, of a capability to draw correct conclusions from the information afforded. It was hoped by means of that Conference full information would be afforded, and that by considering that information correct conclusions might be arrived at.

It was very difficult indeed, in dealing with this question, to separate between that amount of pressure which was necessary to help and stimulate the progress of knowledge, and the over-pressure which did harm, but there was a considerable feeling abroad that over-pressure in schools was doing a considerable amount of mischief, and was likely to do still more. He would not express any opinion upon this point himself, but would refer to the various propositions which had been drawn up as a means of guiding the course of discussion rather than with the view of being submitted as resolutions for adoption—these being as follows:—

1. That the prevailing system of schooling, being mainly directed to prepare children for examinations which are not only of undue severity, but in which a semblance of knowledge is more highly valued than real intellectual development, is attended by an expenditure of vital force which is in excess of any advantage derivable from it.

2. That the long hours of confinement in what is too

often a vitiated atmosphere, coupled with other ordinary conditions of school work and discipline, exert a hurtful influence upon the physical development of the frame, especially upon the heart and lungs, and upon the organs of vision, and that this influence is so considerable that it must already be regarded as a matter of national importance.

3. That it is contrary to sound physiological principles that children of tender age should be called upon for home work after school hours.

4. That there is abundant evidence to show that the strain of so-called "education" upon scholars and teachers is excessive, and acts as a predisposing or exciting cause of disease of serious and, occasionally, of fatal character.

THE EFFECTS OF MODERN SYSTEMS OF COMPULSORY EDUCATION AND COMPETITIVE EXAMINATION ON THE MENTAL AND PHYSICAL HEALTH OF THE COMMUNITY.

By J. PRIDGIN TEALE, M.B., M.A. (Oxon), F.R.C.S.

TWO great national movements are taking place and gathering force at the present moment, both of which it is the aim of this International Exhibition to illustrate and advance. One of them is directed to the study of the conditions which tend to the prolongation of life, and to the attainment by the community of more healthy conditions of living, and of a better and happier state of bodily existence. The other is directed to the cultivation of the intellectual powers, and, by the universal diffusion and increased efficiency of education and educational

methods and appliances, to the bringing about of a higher state of mental culture throughout the nation. The second movement is the natural counterpart of the first, and the two ought to be mutually helpful. And yet there are arising in the minds of many who are competent to judge serious misgivings as to whether the second is not tending to defeat the objects of the first and injuring bodily health, while at the same time it is proving suicidal, over-reaching itself, and defeating its own highest aims. It is in the full belief that great and increasing harm is being done to both physical and intellectual development that I have consented to discuss in this paper one of the main factors which moulds and tyrannizes over education.

The short time at my disposal would not allow me, even if I had the materials at hand, to do more than touch upon certain salient points which need discussion, nor to attempt to prove statistically or by other means the existence of harm resulting from educational methods. It shall be sufficient for my purpose that there is at the present time in this country a very widespread feeling that educational work is ill adjusted, and that it is in not a few instances doing real physical harm, lowering more or less permanently the vigour of many individuals; and that this view is held very largely by, and in a great measure emanates from, the medical profession, a body of men perhaps better qualified to judge than any other, on account not only of their technical knowledge and exceptional opportunities of observing, but also from the fact that their collective judgment is but little influenced in such a matter by the motives that may tend to bias the minds of those who approach education from either a religious, a political, or a pecuniary point of view. During the last year and a half medical opinion has been pronounced, with no uncertain sound, on many occasions on which medical men have given presidential addresses or lectures either to their professional brethren or to a more general audience. Professor Humphry, of Cambridge, as President of the Sanitary Institute; Sir Andrew Clark, as President of the Clinical Society; Dr.

Theodore Williams, in the annual oration before the Medical Society of London; Dr. Rabagliati, of Bradford, in a paper read before the Conference of Elementary Teachers; Dr. Williamson, of Ventnor, in a letter to the *Lancet;* Dr. Clouston, in lectures at Edinburgh, all touch upon the relation of modern education to health, and point out the dangers that are being incurred from the want of proper adjustment of the two. Dr. Thorburn, in his introductory lecture to the course of obstetric medicine at Owen's College, sounds a note of warning in the education of women, and quotes opinions of many of the leading American physicians as to the ill effects of the recent excessive educational work on American girls. Dr. Joy Jefferies, one of the leading ophthalmic surgeons in America, in acknowledging my address, "Hurry, Worry, and Money, the Bane of Modern Education," says "You will see that I take the same ground in the last pamphlet I sent you, as must every sensible physician. We must all keep at work instructing the public, who learn slowly but surely."

Having assumed that this body of medical opinion is based upon experience and correct observation, let me now address myself to the proposition which forms the text of my paper. This proposition strikes at the root of the evil, and declares in a chain of statements:—1. That present methods of schooling are directed too exclusively to examinations. 2. That examinations are of too great severity. 3. That a semblance of knowledge is elicited thereby, rather than evidence of a real development of intellectual faculties. 4. That the result does not compensate for the exhausting expenditure of vital force by which it is attained. Examinations are at the present time in England a sort of national craze. We have taken refuge in them as a panacea for all kinds of difficulties, as an easy way of "contracting ourselves" out of responsibilities in the disposal of patronage, and as a powerful lever to get work of some sort or other out of those whose inclination is to shirk mental exertion. It is not my intention to dwell upon the effects of examination in elementary, i.e., in State-

aided education. These examinations are intended to test results, so called, and to dole out pay accordingly. Public opinion has been roused to question the value of the "results," and the physical effects of much of the elementary education that is now being carried on, and the Education Department has been thrown into an acute attitude of self-defence, denying as far as it possibly can the existence of over-pressure or injurious results of its system, and yet at the same time trying to mitigate in many respects the exacting incidence of its money-gauging regulations. Public opinion is on the alert, and the educational authorities are on their trial. In due time, no doubt, as angry feelings subside, a more fair and reasonable adjustment of requirements and capabilities will be arrived at which will secure, we may hope, education without pressure, counterfeit or cram, and a fuller return for an enormous public expenditure in the form of truer training, more honest work, and a happier life for inspectors, teachers and scholars.

It is, however, to the effect of examinations and more especially of competition in higher education that I wish to address myself to-day. That examinations in England are having an intense and injurious effect upon higher education is my firm conviction—a conviction that is deepened the more I look around and study the conditions under which they are carried on. Few persons can read for an examination without anxiety; fewer still can study for an examination which is competitive, or which affects their position in life, without making efforts, either more intense or more prolonged, than their judgment would tell them was right, were they able to consult either their physical good or educational growth. Such anxiety and exertion tax the nervous system, depress the powers of nutrition and digestion, and so in turn starve the brain of the recuperative resources by which it should be prepared for future healthy work. Granting that examinations are necessary, I claim that, inasmuch as the efforts called forth by them are physically costly, they should be looked upon as double-

edged weapons, to be used sparingly and economically—to be used scientifically, with a view not only to their immediate object of testing education and selecting the best, but chiefly, and above all, to their educational influence on future study.

And what is the bearing of examinations upon education at the present moment? Every educational arrangement in our schools and universities converges to examination, as to a focus. The ancient idea of educational training seems to be almost abandoned in despair. Honours' classes are multiplied; scholarships founded to aid the poor are diverted from their true purpose, and distributed as mere prizes for those who succeed best in examinations, and as the means of obtaining the pick of clever boys who may win credit for their body in the class list. Nor does the evil end here. Colleges with a reputation for success not only attract picked men by scholarships, but try to exclude from their walls all undergraduates who fail to give promise of obtaining, and who will not undertake to read for, high honours. Thus the whole college works at high-examination pressure. We trace the same process at the public schools. The Foundation Scholarships are put up in the examination mart. Intended by the founder to help poor scholars, they have been made educational engines of mischief. Hundreds of little boys from twelve to fourteen or fifteen, clever, perhaps, and worked up often at great expense in money, generally at great expense of mental effort and continuous application, prostrate themselves every year before the Eleemosynary Juggernaut. The great schools with their seventy foundation scholarships get the "first growth" of the rising generation, and thus secure for themselves a promising stock for winning the great prizes in the University competitions. Other public schools, less fortunate in their foundation, in order to hold their own offer scholarships which are more openly used as bribes and advertisements. Twice within a few weeks have I seen paragraphs stating how many boys from certain grammar schools had recently won scholarships

at Oxford and Cambridge, and one of them actually stated that the aggregate recent winnings of boys educated in that school amounted to £450. This same school draws clever boys from other schools by the bribery of scholarships, and then, unabashed, advertises its winnings in the local journals. What wonder, then, that we see such an example followed by minor schools and private teachers? Verily mammon has taken possession of education, and is ruling and ruining it. Another paragraph in a local paper announced that two boys from a neighbouring school had won scholarships at one of our public schools worth £90 each for five years. One boy was fourteen; the other thirteen. The candidates were ninety. The examination, a severe one, lasted three days, and the subjects of examination were English, Latin, Greek, French, arithmetic, Euclid, algebra, trigonometry! Surely the force of folly can no farther go. And what of schools which prepare these ninety promising boys? Preparatory schools have to try to allure clever boys by scholarships open to children, unless they have already won by solid good work in times gone by a high reputation. Even then it is an uphill struggle to keep their position in the face of this advertising competition, and—shall I say it—the short-sighted greed of parents who would sacrifice for immediate educational prizes the ultimate sterling welfare of their children.

At a public school examinations again beset the boy. Every term his position depends greatly upon the examination, and every boy is struggling hard to secure his "remove," with the fear of "superannuation" staring him in the face. "Superannuation," as now carried out in many of our public schools, is a very serious, and is likely to become a very injurious and unjust factor in education. When first introduced its object was good. It was intended to weed out boys hopelessly backward, who as big older boys among younger ones were doing no good to themselves and harm to their class-fellows. The effect, however, is insidious and progressive. At first none but *idle* and exceptionally dull boys fall under the rule; then

boys dull but not idle; and when all the exceptionally idle and dull boys have been cleared out, the rule still goes on closing in upon industrious and average boys, like an elastic band, ever acting, ever tightening, ever eating more deeply. Such a rule, when once it reaches industrious boys of good character, becomes unjustifiable and a positive wrong. Boys are dismissed from the lower forms of public schools, not for any fault of their own, but because other boys more clever, or more skilfully coached, or less honest than themselves, manage to win more marks and secure a remove. Boys of sixteen are turned adrift, after going through the trials and drudgery of their freshmen's years just as they reach the happiest, the most profitable period of public school life, and being too old to be admitted into another public school, have to run the terrible risks of a private tutor's small community. This is cruel to the boys, cruel to the parents, and unjust to the school which loses many of the steady though not brilliant boys; such boys are the back-bone of the school and of the nation, and turn out some of the best workers in after-life, often, like the tortoise in the fable, proving winners in the long run. But the effect is far-reaching. It induces a constantly increasing competition in the lower forms of the school itself, and it compels more early pressure in the preparatory school in order to secure a boy against the dreaded superannuation. The immense popularity of our public schools at the present time is not an unmixed good for the community, as it compels them to make a selection from their too numerous applicants, tempts them to resort to competition as an easy means of selection, and enables them by means of "superannuation" to ride rough-shod over the interests of dull and backward boys, who above all have need of the careful teaching and training for which such schools exist. Surely in so doing our great schools repudiate some of their most solemn obligations as national educational institutions, and whilst scrambling for the hares reject as worthless the not less valuable tortoises.

As a conclusion to this paper, let me sum up my views

by setting forth the following points for consideration by those responsible for education:—1. That examinations are powerful agents, capable of doing harm as well as good. 2. That work for an examination is essentially work done under pressure and with anxiety, and is physically exhausting. 3. That, whereas in view of the physical well-being of the community, examinations ought to be as few as possible, and at long intervals, they are being multiplied with a recklessness which can only be explained on the supposition that the physical and medical aspect of education has been entirely left out of consideration. 4. That the element of competition greatly intensifies the physical strain of examinations. 5. That a further aggravation of the physical strain is produced by the imperfection of examinations. As a rule they test, and by testing, enforce in education, a loading of the memory rather than a training of the faculties. 6. That the multiplication of subjects to be studied for examination is a growing evil, and deserves condemnation both from a physical and an educational point of view. 7. That the arrangements for higher education ingeniously provide a constantly-increasing pressure upon our rising generation—(*a*) By the multiplication of university honours; (*b*) by the exaggerated value attached to university successes; (*c*) by the advertisement of school successes through the press; (*d*) by the competition for entrance scholarships at the public schools; (*e*) by superannuation at the public schools; (*f*) by the competition of one school with another for clever boys and girls, justly stigmatised by Miss Beale, Principal of the Ladies' College, Cheltenham, as "a modern form of slave trade;"* (*g*) by the money value attached to success in examinations, whereby self-interest and mark-winning are made the levers of education rather than a sense of duty and high principle. Let me conclude by quoting from the remarkable essay of Miss Beale already referred to:—"Who can tell, when the golden age returns, whether it may not be considered disgraceful for a school or college to offer bribes to parents;

* *Journal of Education*, May 1, 1884.

whether in that golden age money payments by results shall have ceased, and slave-trade in boys and girls shall have been abolished—that system by which they are purchased for a given number of years, and required to labour at certain tasks, simply for the honour and glory of a particular school—forbidden to consider what will develop their own nature or make them most useful in the world, and compelled to fix their attention on what will gain a place in the class lists, or what will pay; when the vision of the little child shall not be ever fixed on the winning of some immediate reward, of the youth on the acquisition of money, of the man on what is now called wealth; but there shall be a joy in the acquisition of knowledge and the development of the inward life, and it shall be felt that wisdom is better than gold, and all things thou mayest desire are not to be compared unto her?"

OVERWORK IN SCHOOLS.

By R. Brudenell Carter, F.R.C.S.

THE observations which have been made by Mr. Pridgin Teale have relieved me from the necessity of occupying the time of the meeting by merely introductory matter, and enable me at once to invite attention to the proposition which I am called upon to present to you, and which is expressed in the following words:

"That the long hours of confinement in what is too often a vitiated atmosphere, coupled with the other ordinary conditions of school work and discipline, exert a hurtful influence upon the physical development of the frame, especially upon the heart and lungs, and upon the organs of vision, and that this influence is so considerable that it must already be regarded as a matter of national importance."

It must surely be unnecessary, in the present state of knowledge, for me to defend the assertion that the playful activity of young animals constitutes a powerful stimulus to their healthy development. We recognise, as matters beyond controversy, that active bodily exertion is a necessary condition of complete expansion of the chest and of complete aeration of the blood; and that these, together with the contraction of muscles during voluntary effort, are necessary conditions of the perfect growth, not only of the limbs and of the organs of digestion, but also, and in an equal degree, of the brain and other nervous centres. If the conditions be left unfulfilled, if the chest be imperfectly expanded, if the blood be imperfectly aerated, if the muscles are inadequately exercised, then we know, with as complete a certainty as any which can attach to a mathematical demonstration, that the nutrition of the body as a whole, and of the brain and other nervous centres as parts of it, will be imperfect; and that the mind will be incapable of employing, to any useful purpose, the stores of information with which scholars are so often compelled to overload the memory. I cannot but deem it a misfortune, from many hygienic points of view, that instruction in physical science has, until lately, been neglected in our higher schools and in our universities; for one consequence of the neglect is that many of those who make our laws have never been taught anything which enables them to realise, in a definite or certain way, the inevitable character of physical results. If this inevitable character had been realised, we should not now require to urge upon politicians and upon officials, as a new and most unwelcome truth, that, however desirable it may be to educate the people, education, to be useful, or to be other than actively injurious, must be conducted in obedience to physiological laws. The politician, or the official, as a rule, has lived and grown in an atmosphere of compromise, of opinion, of expediency; and it is difficult for him to understand that there are spheres of action which lie altogether beyond these things, outside of possible contact with them; or to assimilate the

notion of the existence of laws which are unfailing in their operation, and before which living creatures must bend, if they would avoid being broken. The law of gravitation, by virtue of its somewhat intrusive character, and of the rapidity with which it asserts itself, has somehow come home to most minds; and hence Parliament has never been asked to pass a measure for compelling water to run up hill, or for empowering architects and builders to commence the construction of houses at the roofs. Parliament has, however, not only been asked to pass, but has passed, a measure for making, or for empowering a government department to make, regulations concerning the management of schools which are in direct contravention of laws as well established as the law of gravitation, and only less familiar because the results of attempts to violate them are less immediately perceptible. By virtue of these regulations, children of tender years may be confined for many hours of each day in school-rooms, often with very inadequate provision for the renewal of the contained atmosphere, often with no proper regard either to the quantity or to the mode of incidence of the light, and often with very defective arrangement of the desks and seats, for the avowed purpose of assisting these children to develop and to exercise functions to the full development and right exercise of which the supposed conditions are directly prohibitory. There is a terrible ignorance of the right meaning of words in calling this "Education," for education was long ago said by Paley to comprise "Every preparation that is made in our youth for the sequel of our lives;" and therefore I prefer to speak to-day of "schooling." The declared objects of schooling are, in the first place, to train and improve the faculties of observation, memory, and reflection; and, in the second place, to do all this by imparting knowledge which is calculated to be of practical use to the scholar. The faculties in question were once, I believe, regarded as being in some way independent of the bodily frame, outside of it, so to speak; but all who know the elements of physiology are now

aware that these faculties depend absolutely upon the integrity and the adequate maintenance of nerve tissue. These, in their turn, depend as absolutely upon due expansion of the chest; a process which school attitudes and surroundings impede in various ways. We all know by experience that it is more easy to expand the chest when there is a fixed point for the upper extremities; and anyone who is tired by sedentary work, and who wishes for a long breath, will instinctively lean against the back of his seat, and, if it has arms, will grasp them, or will rest the elbows upon them, in order to fix the shoulders, and to render them a starting point for the action of the respiratory muscles. It is impossible to fill the chest when slouching forward on a seat without a back, and without support for the elbows; and all breathing which is accomplished in such a position is necessarily shallow and insufficient. Such breathing means the imperfect expansion of the ultimate air-cells of the lungs, and the imperfect aëration of the blood. Imperfect expansion of the air-cells implies also imperfect expansion of the chest walls; and it is certain that these two conditions, if operating with sufficient frequency and over sufficiently long periods of time, will place physical obstacles in the way of a return to a better state of things. The chest, forbidden to expand to the full extent, will lose the power of doing so, both as regards the elasticity and dilatability of the air-cells, and as regards the capacity of the general cavity; and the imperfect breathing, which at first may be only temporary, the result of vicious attitudes and of undue confinement to a constrained position, will become the rule of life. The consequent retardation of the blood-current will serve to retard and oppress the action of the heart, at first temporarily, afterwards in a more permanent manner. If such conditions be established, it will be impossible for the brain and other nervous centres, no longer fed by a full supply of healthy blood, to attain to the development and to the usefulness which would have been normal to the individual owner in more favourable circumstances; and the bodily and

mental vigour must both suffer accordingly. Imperfectly aërated blood is a narcotic, directly producing languor of movement and toleration of positions which would otherwise be too irksome; and there is no doubt that the imperfect ventilation of many schoolrooms, and the imperfect respiration due partly to this cause and partly to the attitudes of the children, are powerful agencies in promoting the attainment of stillness and so-called "order." The natural restlessness of a child is subdued, to some extent by the narcotic influence of carbon-loaded blood, and to some extent by the fear of punishment, which in itself, let me remind you, is a frequent cause of shallow breathing. The view for which I contend, therefore, is that the attitudes and conditions of school life are detrimental to the proper expansion of the chest, to the proper action of the heart, and hence to the proper development of both the muscular and the nervous systems; that they are detrimental, in other words, alike to the *mens sana* and to the *corpus sanum.* No doubt it must be admitted that these attitudes and conditions are to some extent necessary; and, if so, what we have to ask is, first that they should be so controlled as to be as little hurtful as possible while they are maintained, and next, that they should not be maintained too long. The late Mr. Charles Paget, formerly M.P. for Nottingham, once tried, in the village school on his estate at Ruddington, a very interesting experiment. He was not satisfied with the general progress made by the boys, and he provided for them a large garden. The school was then divided into two similar sections, one of which was kept to the ordinary school work for the ordinary hours, the other for half of these hours only, the rest of the school time being devoted to work in the garden. At the end of the term, the half-time, or gardening boys, had excelled the others in every respect, in conduct, in diligence, and in the results of study. A similar experiment is said to have been tried in America as between the sexes, with the result that the girls in a given school at first excelled the boys,

but that, when the boys were set free to play during half their former school hours, they soon overtook and excelled the girls. Now what we desire is to induce educators, as they are called, to look facts in the face, and not to trundle their mops against the Atlantic. They cannot alter the laws of life by departmental regulations, and they will be compelled, sooner or later, to recognise these laws and to submit to them No doubt, if the Educational Department had been consulted at the creation, the young of the human race would have been so organised as to endure unlimited schooling without detriment, or even with advantage. As it is, the facts are otherwise; and now that schooling is made universal and compulsory, it is doubly necessary that the periods of work in a confined atmosphere, and in confined positions, should be more frequently interrupted than is at present the rule. Perhaps the best plan would be, at stated intervals, to break up the classes for a few minutes of extension movements in the playground, or in another room of sufficient size; while the actual schoolroom was in the meantime refreshed and purified by the free admission of air.

The influence of schooling upon the organs of vision, which constitutes the next branch of my subject, is only a part of the injurious influence exerted upon the eyes by the conditions of civilisation generally. It is necessary to premise that a natural eye sees a distant object clearly and without effort; and the quality, or as it is technically called, the "acuteness" of vision, is determined by the size of the object which can be clearly seen at a given distance. The power of adjusting the eyes to see a near object is another matter, and for vision-testing it is necessary to remove the object to a distance beyond that at which any such adjustment should be required. We take a standard, necessarily somewhat an arbitrary one, as the representative of natural acuteness of vision; and we say of anyone whose vision falls below this standard that it is "sub-normal." If the standard were to see a given object at 100 feet, a person who could not see this object until it was brought

to a distance of 75 feet would have vision that was sub-normal in the ratio of 75 to 100, or vision equal to three-fourths of the standard. One who could not see it until it was brought to a distance of 50 feet would have vision that was sub-normal in the ratio of 50 to 100, or vision equal to half the standard. The standard in common use must be regarded as an indulgent one, for it falls below the actual average of the acuteness of vision of healthy children, in the ratio of 20 to 22·5. Sub-normal vision depends sometimes upon mischief left behind by past disease, from which the eyes have only partially recovered, but, more frequently, upon defective shape of the eyeball. This should be almost a sphere, and it is liable to depart from sphericity in two opposite directions. It may be elongated from front to back, or oval, in which case the eye is "short-sighted," or it may be flattened from front to back, in which case the eye cannot be used, even for distance, without adjustment effort. The eyes are the inlets through which the information imparted by schooling is chiefly received; and it follows that, when vision is sub-normal, the information is received with a difficulty corresponding to the degree of the defect. The scholars with defective vision are handicapped unfavourably by comparison with others; and justice would require that they should receive due consideration for the difficulties against which they have to strive. Attention was first directed to the state of vision in schools by Professor Cohn, of Breslau, who, in the year 1865, examined the eyes of 10,060 school children, and found 1630 of them with eyes of faulty shape. Of these, 1072 were short-sighted, 139 were flat-eyed, 23 were the subjects of a complicated defect of shape called astigmatism, and 396 were suffering from the results of previous disease. Cohn further found that faulty shape of the eyeballs, especially of the kind which causes short sight, increased steadily, both in numerical prevalence and in degree, as school life was prolonged; being least frequent and least pronounced in the elementary schools, more frequent and more pronounced in the intermediate, most

frequent and most pronounced in the finishing schools. He attributed the increase mainly to conditions which compelled the learners to bring their eyes very close to their work, these conditions being chiefly the defective lighting of school-rooms, and the defective shapes and proportions of the desks and seats. His researches have since been repeated and extended by many other observers, and his results have been fully confirmed in other parts of Germany, in Russia, and in America; while the American observations have shown not only that flat-eyes have a tendency, from the strain thrown upon them by their defect, to pass into the opposite condition of short-sight, but also that this change occurs with the greatest certainty in underfed or unhealthy children, and in schools where sanitary conditions are neglected. In England no precise or extensive observations of the same kind have, as far as I am aware, been recorded; but my friend and colleague, Mr. Adams Frost, was good enough last week to examine for me a Board School in the South of London, and he found that 73 children out of 267, or rather more than one-fourth, had sub-normal vision. Among these 73, 26 were short-sighted, 16 were flat-eyed, and in 31 the defect of sight was due to other causes. Of the 194 children with normal sight, 40 were flat-eyed, and thus are called upon for unnatural exertion in the act of seeing; exertion which cannot fail to tell upon them in after life, or even before they leave school. It is possible that these figures may require correction in some few points, as, for example, mistakes caused by lack of intelligence may in some instances have been attributed to sub-normal vision; and similar observations must be made upon a more extended scale before exact conclusions can be drawn from them. They are sufficient to show, however, that the question of eyesight is one of the very first importance in schools. In 1812, the late Mr. Ware communicated to the Royal Society the results of some investigations into the sight of different classes of people; and he stated that, in the three regiments of Foot Guards, short sight was "almost utterly

unknown." During twenty years, and among 10,000 men, not half-a-dozen soldiers had been discharged, nor half-a-dozen recruits rejected, on account of it. In the military school at Chelsea, among 1300 children, he found that there were no complaints of short-sight, and, on closer investigation, there were "only three children who experienced the least inconvenience from it." The malformation which produces short-sight is one which has come into existence, in Europe, within historic time, and into prevalence almost within living memory. The Chinese were probably the first people who systematically offered up their children and young men, at least those of the so-called literary classes, to the Moloch of over-schooling and competitive examinations; and it is remarkable that they are supposed to have been the inventors of spectacles. Among the much-schooled Germans, short sight now prevails to an extent which is elsewhere unknown; but England, America, and Russia may be said to be competing for the second place. If we are to extricate ourselves from this competition, and to conduct schooling in such a way that the acuteness of vision of our children may be maintained, it will be necessary that all questions relating to the subject should be decided by the aid of experts. The type of books, the position and magnitude of windows, the use of artificial light for study, and the use of spectacles in cases that require them, are among the chief matters to be thus considered; and above all it is imperative that schoolmasters, and why not parents also, should understand what is meant by normal or sub-normal vision, and should learn to apply the simple tests by which the existence of one or the other can be ascertained. It is grossly cruel and unjust to call upon a child with sub-normal vision to do the same work, and under the same conditions, as his normal-sighted schoolmates; and this cruelty and injustice are of daily occurrence. In the exercise of my profession, I see many children with defective sight, and a very large proportion of them have been unjustly punished, before the defect of sight was discovered, for supposed carelessness or inattention.

This alone is no small evil, but a still greater one remains behind. Short sight, as a matter of physical formation, is constantly transmitted to offspring; and, if we assist in its development and increase, we are providing for the multiplication of a defect which, unless systematically corrected by spectacles, compels the subjects of it to grow up in ignorance of the world in which they live. A visual horizon which is limited to a few inches causes the mental horizon to become similarly contracted; and this, if I may fall back upon the terms of the proposition which I have undertaken to illustrate and to defend, is surely "a matter of national importance."

PUNISHMENT IN SCHOOLS: NOTES ON SOME OF ITS METHODS AND EFFECTS.

By C. E. SHELLY, B.A., M.B.

THE primary idea involved in the term punishment is doubtless the infliction of *pain* as a *penalty* for wrong done. The progress of civilisation has resulted in the gradual subordination of this phase of its meaning. Nowadays, we deem the present mutilation of the culprit of less moment than his moral reclamation; and in punishing offenders, the idea of correction overrides that of mere vengeance. This is most clearly brought out in our treatment of the young, to whom the application of punishment in schools is supposed to be regulated by some consideration for their future moral welfare. But although this is, theoretically at all events, the case, it is not the only aspect of the subject which demands consideration.

In the first place, we must admit that some provision for punishment is a necessary appurtenance of any educational system; because of the human nature with which that

system has to deal, the restraints which must be put upon its innate waywardness, and the necessity of correcting inevitable irregularities. It is possible that both pupil and teacher have suffered from these facts not having been always looked fairly in the face;—that it has been too much the custom to regard the necessity for punishment as a disagreeable accident, which can be met off-hand by such haphazard methods as chance to present themselves at the time. Whereas, having regard to the conditions of education and to the inherent qualities of human nature, punishment—in its aspect of correction—is, rather, now and again an inevitable necessity of these circumstances; rightly regarded and rightly used, it may surely be made a means—disagreeable to employ, undoubtedly; well dispensed with, if possible; but most unwisely shirked, if shirked at all—a means of bringing out good qualities as well as of correcting evil ones. Secondly, the necessity for its employment must always be indisputably established before punishment is resorted to. In the third place—and it is with this, the physical side of the subject, that I wish now to deal—it is demanded, alike by justice and by humanity, that the means and the method of the punishment be suitable in themselves and duly adjusted to the desired end; that, for instance, the mental task imposed shall not overtax the intellectual powers, or rob the system of its due share of recreation or of repose: that corporal punishment be not so inflicted or of such a nature as to mar or injure: that, in short, there be no infraction of that right which theoretically we allow to all—the possession of both the *mens sana* and the *corpus sanum*. The subject, therefore, is one which deserves to be treated from a somewhat higher standpoint than that generally accorded to it. The due foresight and arrangement demanded for carrying out the details of a punishment should not be regarded as degrading, or unworthy of thoughtful consideration; and earnest care ought always to be taken that in satisfying the claims of justice, a counterfeit presentment of true mercy does not entail immediately

harmful consequences, or substitute future mutilation for present pain.

Of the two dangers here indicated the latter is the more to be dreaded, because, not only is it prone to assume a specious disguise, but it is directly favoured by certain important tendencies of modern feeling. The rebound from the approval of those harsher forms of corporal punishment, somewhat indiscriminately employed a few generations since, has been considerable; but, in addition, there is a vein of somatophily, if I may so call it—a body-love—tincturing the usages of modern life, which tends to shirk corporal suffering in favour of what it is pleased to think an equivalent of mental effort. One reason for this is clear: the anguish of bodily pain is sharp and immediate, and appears, therefore, to be very real; the irksomeness of mental effort is less incisive, and its effects—when harm accrues from it—are more remote and less obtrusive. But I, at least, fail to understand why it should be regarded as a more degrading punishment to be subjected to even severe, yet temporary, bodily pain or inconvenience, than to be made to suffer some real impairment or deterioration, however slight, of that intellectual capacity whose full employment alone substantiates man's title to the lordship of creation.

The whole scheme of the modern educational system unfortunately tends in the same direction, and is strangely at variance with the latest teachings of science. Children seem to be regarded, not as units with differing powers, and with tendencies to variation, both of mind and body, in divers directions; but they are grouped according to ages or to arbitrary standards; all are to be worked up to a certain level, and the distinctive mental peculiarities—the "bent"—of the individual is ignored or sacrificed in order to produce compact uniformity of the mass. We have heard from several competent authorities of late, how great is the mental strain which such a system implies and imposes; we know also that these are demands to which not a few

young brains fail to respond, or—even less happily—respond only by such efforts as result in the serious impairment of their powers; and we know further that for all who fail to complete their tasks—it matters not whether it be from real mental incapacity or from genuine idleness—the punishment allotted is usually of such a nature as to compel the exercise of further mental effort for its fulfilment. Moreover, this punishment has too often to be accomplished during the time which would otherwise be devoted to meals, or sleep, or play—a further aggravation of the normal as well as of the added burden. When a child is the subject of defective sight or hearing, the heedless enforcement of such a system is attended with even more lamentable results. It is a tolerably safe, as well as a charitable maxim, that the stupid child, so-called, is in most cases a sufferer from some form of deafness or of bad sight. But, as I have elsewhere remarked, the victim of defective vision is still too commonly condemned, by way of punishment for its supposed laziness or inattention, to further and excessive abuse of its delicate and imperfect eyesight. It is like an echo of the cry of the Egyptian taskmasters of old—"Ye be idle": "You are lazy, you are careless, you are inattentive." The tale of bricks shall not be lessened,—"In addition to your other work, you must learn this passage by heart during play-hours," or, "You must bring it to me written out so many times," until at length Nature's indignant remonstrance, in the form of a "sick-headache," leads to a domestic diagnosis founded on the convenient discovery of surreptitious toffy or unripe fruit, and to a treatment by castor-oil and starvation, which is successful for the time, because it includes the unappreciated factor—rest. I would deprecate, then, all forms of punishment which encroach upon the period of recreation or of rest, with *work of the same kind as* that with which the school-hours are legitimately occupied: such are short-sighted methods with far-reaching effects. Education does not end with school life; and how are your school-boy and school-girl to seize the opportunities and to take the

"punishing" which the world will give them sooner or later; how are they to profit by the experience which they will surely have to buy if during the earlier years of life you have stunted their growth, sapped their stamina, weakened their eyesight, and taken the keenness from their energies, by your neglect of the truth, that while life lasts body and mind are united in our being, and that in order to the development of perfect man or womanhood, neither constituent must be neglected or abused.

In the case of young children, such correction as may be found necessary to the carrying on of their education, may always be provided for by debarring them from some accustomed or specially prized item in their amusements, and should never be attempted by imposing extra tasks, or by extending the period allotted to their daily work. The same principle is applicable to those of more mature years; but, while the moral influence of a justly evident indignation is often of value, it need scarcely be pointed out that in no case ought anything like ill-temper to be displayed in apportioning punishment; and that children are keenly sensitive to any trace of injustice in the treatment which they receive. There exists one variety of school punishment, very generally resorted to, which a somewhat squeamish humanity affects in preference to any form of corporal chastisement. I refer to the different kinds of written imposition. "What the exact value of these may be, from a disciplinary point of view, we cannot profess to determine; no one who knows or remembers anything of school-life will pretend that one boy in a hundred so punished learns anything valuable, or in a valuable way, from a passage which he writes as fast as is consistent with tolerable legibility, often from friendly dictation, and with no more acquaintance with its sense or meaning than is necessary for the avoidance of gross and obvious errors; or, that he reaps any moral benefit from the 'lines' which may sometimes be copied during the hours of regular school-work, which—if a sufficient similarity of handwriting can be assured—may even be contracted for upon one of the

many fluctuating bases of schoolboy barter and exchange," and the execution of which, in the case of a lengthy imposition, may be so prolonged that the culprit loses all appreciation of its why or wherefore in the dreary consciousness of a disagreeable task. "It is, at least, certain that the custom is one which lays an extra burden upon the child whose play-hours should be devoted to recreation; which tries the eyesight, and tends to dull rather than to brighten the intellectual powers; which favours a stooping habit, contracts the chest and rounds the shoulders; which keeps the child indoors when he should be out; and which fosters crabbed and illegible cheirography. If such punishments must be worked out during playtime, then their nature and method should be so contrived that they may not directly aggravate the necessity for that fresh air and bodily exercise upon which depend the value of play as opposed to mental work. In most of our larger schools, at all events, some such arrangement would not be impracticable. Many of these possess a carpenter's or other similar workshop, in which not a few boys spend much time for their own amusement, and in which, in some instances, they have the advantage of receiving regular instruction. The carpenter or blacksmith would be able to gauge the working capacity of each of his pupils, who might be arranged in classes accordingly; and thus, in place of so many hundred lines, or so many copies of that misconstrued passage, the delinquent would receive the order to saw, square and plane up so many feet of quartering, to turn a chair-leg of a certain pattern, or to forge so much ironwork, according to his capabilities and the gravity of his misdeeds. Work of this nature would imply not merely active, healthy, bodily exercise under good hygienic conditions, but would entail the acquisition of practical knowledge which could not be useless, and which might at any time prove most valuable to its possessor. Its punitive character would be sufficiently ensured by the consideration that it took the place of an equivalent of cricket or of football, &c., and, above all, by the fact that

it was compulsory and not voluntary labour." If my critics object that such a plan smacks too much of the system of the notorious Mr. Squeers, who made his pupil, after spelling "horse," "go and rub it down," I would reply that, in my humble opinion, the incident quoted deserves "something better than the ridicule which it usually provokes; for, after all, was it not a form—crude it may be—of those 'object lessons' in which all the value of modern scientific education is now said to consist?" Personally, and in either capacity, I should myself prefer the adoption of some such system to that which has recently been reported from a school in the North of England, in which it is stated that discipline is enforced by the administration of full doses of castor oil, a method which you will probably agree scarcely compares favourably with the brimstone-and-treacle dietary of the famous Yorkshire establishment.

There is yet another branch of the subject which we cannot ignore. Do what we may, so long as human nature is human nature still, there will continue to arise from time to time, the necessity for a resort to some form of corporal punishment; and while parents and schoolmasters continue to exist and to exercise authority, the question as to its character and the least undesirable method of inflicting it, will have to be faced. And here let me at once enter a vigorous protest against that unfortunately too convenient, but most dangerous and still much too common habit of boxing the ears. Most educated people are probably alive to its dangers, but the practice is still so far from being obsolete that one is bound to sound a note of warning against it. I cannot do better than refer those who are interested in the reasons for its harmfulness to a paper on "The Function of the Membrana Flaccida" which will be found in *Nature* for Dec. 7th, 1882, p. 129, and I may perhaps be allowed here to give a *résumé* of the author's explanation of one of the modes by which deafness and other forms of ear-trouble are thus produced. The delicate membrane forming the "drum of

the ear" is firmly attached to the bony walls of the auditory canal along the lower two-thirds of its circumference, but its upper and more opaque portion, technically termed the *membrana flaccida*, is comparatively loose. In fact, its upper margin blends with the movable skin lining the roof of the canal, which glides smoothly to and fro over the surface of the polished bone beneath it, and thus becomes directly continuous with the cartilaginous portion of the external ear. To the ear are attached, as we know, several small muscles, which, in human beings, have mostly lost their function and their activity, though we see them in frequent play in the rapidly-moving ears of horses, dogs and other animals. Amongst them, however, is a muscular slip derived from a portion of the great muscle which lies on the top of the head, by which the hairy scalp can be moved backwards and forwards in some people, and part of which is put in action when we raise the eyebrows. Thus, when this muscle is made to contract, it pulls the membranous roof of the auditory canal upwards and slightly forwards, and so drags upon the *membrana flaccida* that the whole tympanic membrane is brought into a more vertical plane, which is its position for acutest hearing. Hence, by the single contraction of the occipito-frontalis muscle both eyes and ears are brought simultaneously into the attitudes of strained attention; so that in endeavouring to hear, as well as to see intently, we involuntarily raise the eyebrows in order to make tense the drum of the ear. If this muscle act violently and sharply the sudden strain on the delicate ear-drum may tear it. We know how a sudden and unexpected blow on other parts of the body will cause a muscle to contract and a limb to jerk; and, similarly, we can understand how—without the direct action of any violent concussion of the air, such as undoubtedly sometimes occurs, e.g. during the firing of heavy artillery—a smart blow on the side of the head may induce sudden spasmodic contraction of the muscle, and thus, through the action of the mechanism described, bring about serious injury, or even rupture of the drum of the ear.

Let us then forthwith erase "boxing the ears" from the list of legitimate methods of enforcing discipline. Other means are not wanting. Caning—judiciously inflicted—is infinitely more merciful, and is surely not ineffective; the birch is even better than the cane, while its application is a practical exposition of the valuable truth that "union is strength." As regards the exact site of punishment, caning on the palms and fingers is not without its dangers, especially in some hands; and, indeed, the posterior aspect of the human form divine commends itself on all the grounds of mercy, convenience and æstheticism. Striking the head, again, is out of the question; blows on the back and shoulders may easily produce needlessly painful and severe results; but there is a region to which such objections do not apply with equal force. As Dr. Bristowe lately put it, "there are some parts of the body which seem made for chastisement," and I would, in the place of head, ears and hands, earnestly recommend as a more appropriate site for castigation, when such is necessary, that portion of the human frame which is sufficiently sensitive to satisfy the sterner demands of justice, and which, at the same time, is so constructed as to be capable of sustaining with impunity violence which cannot safely be administered elsewhere.

Out of such considerations as I have here endeavoured briefly to summarise springs the question, "Is there no means by which we may anticipate, may obviate, that necessity for punishment which appears to be an inevitable attendant of school education?" I believe that there is at least one method of physical training, only too much neglected as a rule, by which a great deal is to be accomplished in this direction, I mean the practice of regular military drill. As to its physical value, there can be no doubt. It converts the lounger, who "slouches" about with bent spine and rounded shoulders, with his hands in his trousers pockets and his eyes on the ground, into an upright, firm-treading, square-shouldered, open-chested lad, carrying his head erect, with eyes observant, and like his *hands, ready* and on the alert for any work they may find

to do. It throws off the "student-pose" which all undrilled school-children are apt to carry into and through their play-hours; and it substitutes a receptive for a cogitative posture. But it does more. Occupying but little time, and not severe in itself, it teaches children to obey, and that on the instant; it forms the habit of subordination to rule, permeates life with the spirit of ready discipline, encourages self-respect and *esprit de corps*, and, later, perfects the capacity for command. These are no slight advantages nowadays, when the power of self-control is admittedly less cultivated than it used to be. The possession of qualities like these is no small check to such infractions of rule and discipline as commonly call down some form of punitive visitation on the offender.

The tender-heartedness of modern days is justified in its unwillingness to endorse the thorough-going and impartial application of this royal recipe; but I think that there are some grounds for asking whether we do not "spoil the child" quite as effectually, although probably more ingeniously—and so more cruelly—by some of the disciplinary methods which the doubtful humanity of the present age prefers to the more robust means adopted by our forefathers. If this be the case, we may feel assured that we cannot ultimately escape the vengeance with which Nature is apt to visit any such violation of her rules. Whenever our methods of dealing with individuals result in their present physical deterioration, we incur the imminent risk of the future deterioration of their race. This paper will have served its purpose if anything which it contains has roused an interest in what the writer believes to be something more than a merely possible danger in this direction.

HOME LESSONS AFTER SCHOOL HOURS.

By Sir JOSEPH FAYRER, K.C.S.I., M.D.

THE proposition which I have to submit for your consideration, as the third of four which comprise the subject-matter of this Conference, is stated in the following terms:—"That it is contrary to sound physiological principles that children of tender age should be called upon to perform home work after school hours." This proposition immediately precedes another, to the effect that there is abundant evidence that the strain of so-called education is excessive and that it acts as a pre-disposing and exciting cause of disease, of serious and occasionally fatal character. If this can be sustained, the subject of my proposition, which is essentially a part of it, must needs be regarded as contrary to sound physiological as it is to sound ethical principles.

It has already been argued that whilst the prevailing systems of schooling are too severe, and are attended by an undue expenditure of vital force, the long hours of confinement, too often spent in a vitiated atmosphere—and sometimes, it is to be feared, with insufficient food—coupled with ordinary conditions of school work and discipline, are productive of injury to physical health and due development of the frame, especially as regards the heart, lungs, and organs of vision, to an extent that must be regarded as a matter of national importance.

These statements form so grave an indictment against the present system of education, that it seems expedient that the subject should be sifted, with the view of ascertaining how far the charges can be maintained and the evil rectified; for if it be proved that such strain exists, there is no escape from the conclusion of the need for interference, not only by parents and guardians but by

the legislature itself! I am aware that this question, like others, has more than one aspect, and that high authority and earnest persons deeply interested in education have pronounced the outcry devoid of foundation, and the charge of over-pressure to be exaggerated, if not altogether untrue. It is a difficult question to decide, for there are complications and disturbing elements in dealing with it which may render it hard to furnish statistical proof of that which is still so thoroughly impressed on the minds of many by personal observation and experience, that it would be futile to deny there is substantial ground for alarm, inquiry and reform. It would be unfair, I think, to hold the teachers altogether or solely responsible. The natural desire to extend intellectual culture, and the stimulus of competition, so severely the rage in the present day, together with imperfect knowledge, or at all events imperfect recognition of the physiological bearings of the question, tend to intensify a struggle in which immature brains and bodies are striving for pre-eminence, and in which it is asserted that many suffer, and some altogether break down!

The object of this communication is to show that this over-pressure, especially in young children, is wrong in principle and hurtful in practice, and that it tends, by the injury it may inflict on the general health, rather to retard than to advance education!

Charles Kingsley, a true philanthropist and friend of children, whose keen sympathy and knowledge of their nature and their needs makes all he says about them worth reading, evidently had this subject in his thoughts when he wrote in one of his charming stories:—"There were as pretty little children as you could wish to see, and might have been still if they had only been left to grow up like human beings, but their foolish fathers and mothers, instead of letting them pick flowers and make dirt pies, and get birds' nests, and dance round the gooseberry-bush, as little children should, kept them always working, working, working, learning week day lessons all week days, Sunday

lessons all Sundays, weekly examinations every Saturday, and monthly examinations every month, yearly examinations every year; everything seven times over, as if once was not enough, and enough as good as a feast, till their brains grew big, and their bodies grew small, and they were all changed into turnips, with little but water inside, and still their foolish parents actually pick the leaves off them as fast as they grow, lest they should have anything green about them."

It is impossible not to admire or, to a certain extent, sympathise with the spirit which insists so passionately on the diffusion of education, and with the systematic efforts by which all classes of our infant and young population are brought within its influence. The machinery of our schools, from the highest, to the smallest dependency of the School Board, is so complete as almost to excite a feeling of envy for the great advantages denied to us, but which are now freely accessible to everybody's children, and we are thankful for the philanthropy which declares that no child in the state shall grow up in ignorance, because education is the means by which a nation should be elevated, and the people rendered prosperous and happy. But it is possible, nay, I fear it is probable, that by over zeal we may be doing harm; for whilst, for education, conducted on sound principles, we can only express appreciation and gratitude; of a system of competitive brain forcing or cramming, we can only say that it is worse than any neglect of schooling which may have preceded it. It is not meant that education of all young persons is of this character, but that there is a great tendency to it there can be little doubt; and whilst on the one hand we gratefully recognise the high purpose which is directing national education, we must hope, on the other, that the defects may be remediable by a better appreciation of important physiological considerations hitherto perhaps too much overlooked.

It would be impossible in the short space of time at my disposal to state all the anatomical and physiological

arguments in support of the proposition, nor is it necessary. It is sufficient to say that this is based on the intimate co-relations subsisting between nutrition and growth of the body and brain and intellectual development. The necessary conditions for the well being of the body are, we know, pure air and water, appropriate food, with due intervals of rest, and such exercise of the various parts and organs as to fit them for the due performance of their functions; so it is with the brain and nervous system generally, and a brain, however gifted or powerful it may be potentially, will fail, unless the conditions of healthy physical life be observed. It is to be remembered also, that during the rapid growth of childhood over-exercise of the cerebral functions, by creating a greater demand for increased blood supply, tends to interfere with the due nutrition of the body and to entail disease. It has been observed that during sudden and rapid growth in young persons the brain power has been diminished to a state of apathy or even of abeyance, whilst on the other hand it has been remarked that the lethargy, the clouding or weakening of mental energy, in such young persons has cleared away as the growing fit has ceased, and the general vigour of body has been re-established. It is needless to insist upon the great care and discretion with which young brains should be worked at these critical periods. Let me, for the benefit of non-medical hearers, mention one or two anatomical facts which have an important bearing on these questions. The brain of a child at birth weighs about twelve ounces; it grows so rapidly, that by the age of three years it has attained to three quarters of the full weight. It continues to increase rapidly till about the seventh year, when it has attained to nine-tenths of its complete weight. Thence on to twenty it still increases, though slowly, and again slower still it grows, till it attains the full measure of its size and power at from thirty to forty years of age. Brains vary in different individuals in size, texture, specific gravity, and quality. They *may* attain, as in the case of Cuvier, to sixty-five ounces, or they may

never surpass the average of the European standard of from forty to fifty ounces. The mass and weight of the brain have a certain but not absolute relation to the bulk of the body as they have to the amount of intelligence; this seems to depend on the relative proportions of grey and white elements as well as on the texture and molecular arrangement; and on these depend also its aptitude for development by education. It is during the early period of rapid growth and development that its susceptibilities are most acute, and are most severely tested, whilst its due evolution is most seriously affected for good or evil.

The question therefore is, how much work is compatible with the welfare of a young growing brain? There is a just medium between too much and too little, which, whilst on the one hand it shall not overtax functional, on the other shall favour physical development. In short, how to train these young brains so as to obtain the best results—not such results as are represented by early precocity and premature exhaustion—it may be by some form of encephalitis—not the production of an instrument which will act as a temporary receptacle for the registration of facts and figures which are lost almost as soon as attained; but an organ which, being susceptible of progressive development, shall be an instrument throughout life of larger and ever increasing powers, is the problem before us.

The antagonism between growth and education may be seen in the stunted physical frames and feeble health of some in whom intellectual powers have been over pushed and prematurely developed, and it is the business of the physiologist to point out that an essential condition of healthy mental development in the young child, is healthy nutrition and growth of the physical organ by which mental activity is manifested.

Dr. Fothergill gave a lecture a few years ago on the relations of growth to education which I recommend all concerned in teaching young children to read. I quote one brief but forcible passage from it. He says:

"The physiologist finds the subject come within his

province, the physician has it before him in cases of illness brought about by over-taxation of the system from educational efforts. At the time that the tiny child is conquering the difficulties of the alphabet, its tissues are growing rapidly; and its nutritive powers have to meet the demands of its tissues, bones, and muscles, as well as those of the brain. It has to grow as well as to furnish nutritive material to the expanding brain, and there is also the increase in bulk of the brain to be met, as well as the wear and tear of functional activity. When the brain is insufficiently supplied with blood its power is cut down and limited. The brain requires nutritive material as well as any other organ for its active functional manifestations. It is as dependent on the body commissariat as the muscles of the legs; consequently, an essential point in all education of the young is to see that the nutrition is kept up by food suitable alike in quantity and quality. If this be not attended to, growth and education will be alike retarded. The child must have nutritive material for the needs of each."

It should be understood that to overtax the growing brain of a child is as erroneous, nay, more so, than to over-work or exhaust its body; either course is liable to entail penalties. Far more severe are those which avenge the over-wrought brain than the exhausted body!

In a recent admirable article, Dr. Crichton Browne has so clearly pointed out the evils of the form of overwork to which my proposition relates, that I venture to quote his remarks, as they forcibly express my own views on the subject. He says:—"School hours fall mostly in the early part of the day, but a little inquiry will reveal that the heaviest part of school work is not generally performed at that time. If any boy or girl be asked 'What is the most trying part of your school work?' the invariable answer is 'Preparation;' and if the further question be put, 'When do you do your preparation?' the almost invariable answer is, 'In the evening.' This is a state of matters that is to be condemned from a medical and from an economical point

of view. The most severe brain effort that the child is called on to perform, that which involves most strain and concentration of attention, that opening up of new ground on which progress must greatly depend, is reserved for the period when brain function is almost at its lowest ebb, and when all the vital powers are exhausted by the exertions of the day. The most severe and important intellectual labour is undertaken just when it is sure to be most injurious and least remunerative. Evening preparation of lessons, if faithfully performed, must be prejudicial to the fatigued brain, and is not even rendered innocuous by a long interval of recreation between it and school work. It often induces sleeplessness and a long train of attendant evils, and contributes largely to the nervousness and debility which are becoming so common amongst school children, particularly in towns, while it fails in securing advancement at all equal to what might be got from a much less strenuous and protracted study earlier in the day.

"The most arduous mental work required of a child ought to be imposed on it when its mind and body are in their prime vigour, between 9 A.M. and noon, and nothing but the lightest work should devolve upon it after 5 P.M. To the medical eye preparation seems to be peculiarly the work which should be carried on in school, with the constant assistance of the master, whose special mission it is to explain difficulties, to remove obstacles, evoke interest, and stimulate endeavour. It is, perhaps, because some masters do not take this view of their office, but fancy that their duty is performed when they prescribe tasks, listen to the repetition of them, scatter over them a few critical remarks, and diffuse around them that magnificent moral influence, which is not, after all, a good substitute for hard work, that tutors and evening governesses have so often to help boys and girls with their preparation, and that parents have to take upon themselves the real drudgery of teaching."

And, with regard to the important subject of rest, the great restorer of exhausted nerve force, and the invigorator

of continued and sustained effort in education, that which is necessary not only to mental but to physical growth —sleep,—I quote again from the same eminent authority, my own experience most thoroughly endorsing the views he expresses :—"It is needless to insist on a sufficiency of sleep for our juvenile toilers, that is of primary importance ; and long hours of rest are requisite for the brain which for many hours has to maintain a condition of high functional activity, for it is during the hours of rest that the organ itself is nourished and grows."

Again, Dr. Crichton Browne says :—

"Some statistics which I have collected in girls' high-schools give these results. In answers to the question, 'Which is the hardest part of your work?' sixty-five per cent. of the girls reply, 'Home work.' In answer to the question, 'When do you do it?' fifty-seven per cent. of these reply, 'In the evening.'

"Is any argument required to prove that that part of the day's work which involves most brain effort and brain exhaustion should not fall on these evening hours, when the nervous system is already fatigued, and when by the laws of its constitution it is least capable of exertion?

"Quite recently a medical man told me this story. 'I was called to see a girl of fourteen, and found her in bed, pale, with dilated pupils, displaying great muscular tremor and much mental disturbance. Her pulse was 120, and her general condition convinced me that she was on the verge of a serious cerebral attack. On making inquiries I discovered that she had been up till one o'clock in the morning of the day on which I was called to her, preparing her lessons for a high-school ; and that, being an anxious ambitious girl, she generally worked till 11 P.M., and once or twice a week till one or two in the morning. I procured a list of the lessons which she had had to prepare on the previous night, and it was as follows :—

"'1. Write the story of Touchstone, giving quotations.

"'2. Commit to memory twelve general questions in geography, each involving at least twelve particulars, such as courses of rivers, products of towns, positions of capes, &c., &c.

"'3. Write out six quarto pages of French grammar and construction.

"'4. Learn, so as to be able to write out in class, all the verbs in a printed page of "Picciola."'

"Having to attend a music lesson in the afternoon the girl was unable to settle down to this work until 6 P.M., and from that hour until 1 A.M. the following morning she worked at it steadily. Little wonder that she couldn't sleep when she went to bed, and 'little wonder,' said my medical friend, 'that I found her on the verge of phrenitis.' Numerous cases more flagrant than this one might be collected."

On referring to Dr. Langdon Down as to the influence on young persons of home work in the evening after school hours, I received the following reply from that high authority; and I can only say that his opinions and experience confirm my more limited observations. I, too, have seen cases of a similar character to those he reports, and it is not unlikely that others are in the experience of many medical men. The expression of such opinions founded on observation, are more valuable than any statistical information, and cannot be set aside as evidence that some change in the mode of education should be effected. He says:—

"My practical experience is quite in harmony with your thesis.

"I have seen several cases where serious brain disturbance has been the outcome of over-pressure.

"I find that the two most dangerous periods are those of second dentition and the period just anterior to puberty.

"I have met with children, and specially remember two cases, who lost speech between seven and eight.

"I have seen several cases of serious mental breakdown from having work to prepare out of school-hours. It begets

over-anxiety, sleeplessness, talking and muttering during the diminished time of sleep, and finally hallucinations of sight and hearing.

"I have recently had under my care a typical case in the Kensington district; before the boy returned to school I gave a certificate, pointing out the peril to him if there was any return to such practice.

"The payment for results is, I conceive, one very strong inducement to the evil.

"I have now under my care a boy of fifteen, who has shown very grave symptoms during his struggle for preparation for the matriculation of the University of London; and another, in his trials for Sandhurst, came home with symptoms which were at first taken for typhoid, but which proved, as I feared, to be cerebritis, and terminated fatally. I am quite satisfied that over-pressure is very common, and specially perilous at the developmental epochs I have mentioned.

"I have had cases from public schools; several from the Board schools; and formerly I used to see a great many pupil-teachers, as well as the unfortunate mistresses who had to prepare the pupil-teachers, but for some cause or other they have been less frequent of late."

The especial point of my thesis is, that evening work, i.e. preparation at home after school hours, is prejudicial to children of tender age; and from what has been already said, I think it must be admitted that it is so. For it has been shown that whilst a moderate amount of work in the early part of the day, say two to three hours, under the guidance of the teacher, in which the mental efforts are not overstrained, is not only harmless, but necessary for the due development of the brain and its functions; yet that evening work is injurious, for the reason above defined. I venture to suggest, therefore, that it would be well for those engaged in teaching, or interested in education, to reconsider the question, and having in view the physiological bearing of the subject, recast the methods of educating young children, especially in reference to the

expediency of confining the intellectual training of those under ten or twelve years of age to work done in the early part of the day, and with the aid and supervision of masters; and that with regard to young people after that age that the evening or preparatory work should generally be diminished below its present standard.

OVER-PRESSURE IN ELEMENTARY SCHOOLS.

By RICHARD GREENWOOD,
President of the National Union of Elementary Teachers.

IT is difficult to invest this well-worn theme with any fresh element of interest, but I willingly undertake the task of attempting to place the views of Elementary Teachers before the public, because it is only by persistence that we can hope to produce any impression in the desired quarters.

When we examine the influences and the conditions under which the work in elementary schools is carried on, we shall come to the conclusion that it would be very remarkable if over-pressure did not exist. The statesman desires to see his country in the van of nations, and feels that the remarkable efforts and sacrifices which foreign nations are making to improve their educational position form a strong reason for increased exertion on the part of all who are engaged or interested in the education of his country. The philanthropist desires to see the residuum raised morally, socially, and intellectually, by education, and insists that the most neglected and backward children shall receive from teachers the greatest amount of attention. The public are supposed to desire to pay only for such educational results as can be accurately gauged, and to be anxious to secure almost uniform intellectual results from children of varying intellectual capacities. The

working man has a hard struggle to make both ends meet, and is consequently anxious to use his child when he wants him, and to see him free from compulsory attendance at school as soon as possible, that he may begin to contribute to the family earnings. The necessities and ambition of both managers and teachers impel them to strive after any standard of excellence which may be set before them. Some children have a strong desire to excel, while others have a dread of any rigorous examination.

It is difficult to arouse the feeling of the English people, but when once aroused it is so much the more difficult and hopeless to resist it. The earnest work which is undertaken in consequence is done under heavy pressure. In 1870 the English nation was at last awakened to the subject of education. It passed an Act compelling the attendance at school of every child, and the Code which accompanied it insisted on the production by him every year of specified and progressive educational results. There were then forced into our schools, among others, hundreds of children, who because of their delicate health, would never otherwise have attended school at all, yet the same results were expected from them as from the healthiest of their companions. The average age at which the scholars reached the standards of examination got lower year by year, and there must have been over-pressure before 1882. In that year another Code appeared which demanded from children and teachers an increase of about fifty per cent. in the work, which was to be produced under more unfavourable conditions. As a teacher of twenty-five years' standing I am satisfied that we are simply playing with the fringe of the cause of over-pressure when we are dealing with anything but this Code. It is too exacting in its demands for *all*, for all children are not alike either in temperament, physique, or mental capacity, and what may be accomplished with ease by one may prove almost fatal to another.

Time will not permit me to read from the Educational Blue-book of 1880-1, the opinions of Messrs. Baily, Fisher, Synge, and Matthew Arnold, H.M.I.S., as to the existence

of over-pressure.* Recently Mr. Arnold said: "Undoubtedly there is danger at present of the child being over-urged and overworked." These gentlemen are all of opinion that under some influence or other teachers often unwillingly take a course which is anything but pleasant to themselves or beneficial to some of their scholars. On the other side, an Inspector writing anonymously to the *Standard* says: "For twenty years and more it has been my duty to inspect schools in the service of the Education Department; many thousands of scholars and teachers have passed under my hands, and not once have I ever met with one single case of illness, entirely or even for the most part occasioned by over-exertion of the brain." In answer to this a lady correspondent in the same paper says, "Inspectors see the children only on the day of examination, and what do they know of them in their homes, and of their sicknesses and trials there. They are the last people to hear truths from the teachers, who simply stand in terror of them, and would

* Mr. Baily says:—"It is a frequent practice to keep dull children in beyond the school hours, but the practice is a most mistaken one, as it can only have the effect of making the dull children duller still. The school hours are quite long enough for intelligent work, and the practice of keeping children in beyond them should be discouraged as much as possible, if not absolutely forbidden."

Mr. Fisher says:—"A point to be noticed and condemned in connection with the organization of schools is a growing practice of keeping children in after the regular hours of instruction, in order to secure what are called higher results in the examination. . . . The extra one or two per cent. of the passes so obtained are largely due to dunces, who are by these means painfully screwed up to the examination point. It is no teacher's duty to risk health and strength over children who can only acquire the minimum of knowledge at such a cost."

Mr. Synge says:—"In some way or another we shall have to recognize the fact that, as men are not equal, so children are not equal either, and that to force the dull child to keep pace with the clever one will be an injury to all concerned."

Mr. Matthew Arnold says:—"Bodily exercise, also, and recreation deserve far more care in our schools than they receive. We take too little thought for the bodies of our school children; we are too intent on forcing more and still more into their minds, unregardful how easily the attention, at their age, may be overtired."

not venture to give an opinion which they feared might militate against their particular views of education." And I would ask by way of analogy what the intelligent foreigner, after witnessing a review at Aldershot, or taking a walk in the Strand, would say to the statement that in England one person out of every twelve hundred was blind? He would doubtless answer "Impossible, for I have seen nothing to justify the statement." Yet we know the statement to be true.

Teachers and children are not the only persons so overworked by the Code as to be driven to suicide. Quite recently the public were shocked by a painful inquiry into the death of an Inspector's Assistant, who for some months had been suffering from mental depression caused by anxiety regarding his duties. I am not surprised at it, for I am told that some of the Inspectors' Assistants not only work sometimes till midnight and on Sundays, but are compelled to call in the assistance of their wives in examining papers.*

It is because the Code exacts immediate and equal results from all children that the attention of the teacher is diverted from the highest objects and aims which should animate him. He who acts on his belief that there is art in teaching can sympathize with Lucca when she says that she likes a Berlin or a Vienna audience, but that a London audience she hates. "Here," she says, "they teach us to sing, simply for the monetary reward, and not for love of the music, and then we cannot sing well. Money can do but little to encourage art, or the artist. I sometimes think it rather harms than helps us; but this I know, that it alone can never induce us to do our best."

Teachers having to do more work than can be reasonably expected of them in school hours, are tempted to push aside

* There are seventy boys in my fourth standard. It takes me nearly four hours to thoroughly examine a set of their arithmetic, and a set of their dictation papers. Of course it would not take an assistant inspector so long as this to examine the papers of one standard simply to decide on the passes and failures.

into a subordinate position subjects which bring no credit at the Government examination. Schools have been heard of where the Scripture lessons have been systematically curtailed, or even suspended altogether for many weeks prior to the Government examination. A diocesan inspector asserts that the conviction he entertains of the reality of the evil (over-pressure) has never before "appealed to and mastered" him in the undeniable form it has now assumed, and by diocesan inspectors generally what is most seriously feared is the danger of relief being sought by shelving religious instruction.

It is desirable that teachers of even the poorest of our children should possess a greater amount of culture than at present, and Mr. Hartland, Clerk to the Swansea School Board, laments the disinclination of teachers, when they have the opportunity, of attending the Cambridge University Extension Lectures. He says, "that with one or two exceptions they display the utmost indifference alike to science, literature, and history, and he regrets that they should think that they possess enough knowledge." I do not believe they willingly turn a deaf ear to the invitation. I am not exaggerating when I say that there are hundreds of teachers, who when they reach home after their day's work is over, are too jaded to eat, and too nervously irritable to be civil to members of their own family, until they have had a rest. It is because the powers of a coach-horse are at the utmost stretch when he is at work in Her Majesty's mail that we do not expect him to work so many hours a day as a dray-horse. The teacher's life is a kind of coach-horse life, and it is just as reasonable to expect that after a hard day's work a teacher should welcome systematic study, as to invite a coach-horse after a hard day's work to take an hour's spin across a stiff bit of hunting country by way of amusement, or for the benefit of his constitution.

Children who pay a fee of *9d.* per week, and who therefore may be expected to be well fed, and to have in many cases intelligent home-circles, have to be kept after school hours in order to secure a pass at the examination, just as

the worst fed children are. Better feeding will only partially remove the difficulty. In a few of our schools so many as 80 per cent. of the children come from homes of one room. On the question of over-pressure should we be expected to sit still, morbidly content, until all these children are properly fed?

It is difficult to say whether the Code was intended as an instrument for overcoming the attendance difficulty, or was formulated on the assumption that this difficulty had been overcome. If the percentage of attendance were raised from seventy-three to ninety-three (the percentage in some foreign countries), some of the over-pressure would be removed, but still not that on the weakly and the dull.

Abolishing home-lessons and overtime would only intensify the evil. The work has to be done, and the smaller the amount of time at disposal, the more severe will be the strain while the children are at work.

Paying teachers fixed salaries, even at their maximum, will not remove the difficulty. The remaining incentives are too strong.

> "Good name in man and woman, dear my lord,
> Is the immediate jewel of their soul."

Also upon a man's reputation depends, not only his chance of promotion, but even the maintenance of his position. Mr. Davis, Clerk to the Birmingham School Board, says, "Whatever good results a teacher's neighbours get, he must get. Hence, however fond he may be of children, naturally he learns to look upon his scholars as so many little machines, out of whom he has to grind certain results. What the weaker children cannot accomplish in the ordinary school hours they must be driven to in extra hours." Why is this? Because the cry is "Produce results, artistically if you can, but produce results."

Even when we get well-fed children, greater regularity of attendance, increased and more efficient staff, better lighted and better ventilated rooms, and greater facilities for the development of the physical frame, there will still be some

school children who will suffer because of their inability to keep step with their class-mates.

Inspectors should not be allowed, under any pretence, to examine beyond the requirements of the Code. It ought not to be possible, e.g., for a Government inspector, with numeration as a hobby, for the sake of supporting his theory, or any other reason, to dictate to children between seven and eight years of age, such an addition sum as this —40; 9; 202020; 111; 10011; 9; 4400; 1100111 (one million, one hundred thousand, one hundred and eleven).* The success of children at the Government examination depends too much upon their teacher's ability to subordinate his own views, and to see eye to eye with the inspector on every subject. Whatever craze an inspector has for a point, whether within or beyond the requirements of the Code, it is the teacher's interest to satisfy it, and by hook or by crook, what is desired is forthcoming when required.

Managers, who are partly responsible for over-pressure, must be less exacting. They do not fulfil their duty by simply meaning well. Let us take the practice of the London School Board. Formerly, an ordinarily good school could obtain the maximum result in a class subject, e.g., geography, if the Government inspector were satisfied with the progress of fifty out of every hundred children. Now, seventy-five out of every hundred (an increase of fifty per cent.) must so satisfy the inspector. To meet this extra demand the time devoted to geography must be increased fifty per cent., and the difficulty is to know from what other subject to take it, for the work of every subject has been increased. Yet if the maximum result in geography is not obtained, the Board practically fines each teacher in the school five pounds a year until he reaches his maximum salary. This may amount ultimately to a loss to the teachers in that school of more than a hundred pounds, as well as involve loss of reputation; and here I would point out to those purists who flippantly and wrongly accuse teachers of thinking of nothing but money, that there is

* *The passing of the children was not affected by the result.*

nothing superlatively wicked in the desire for an annual rise of five pounds in salary. And in addition to the increased requirements of the Code, the London School Board insists on a systematised course of object lessons being given throughout all its schools. This would be very desirable under favourable conditions, but it becomes unreasonable when there is no time at disposal. Yet some of its prominent members lay the flattering unction to their souls that over-pressure in their schools is a thing of the past.

The House of Commons should seriously consider, at an early date, the system of payment by results, with a view to the adoption of a more rational scheme than we have at present, and should at once cause a public inquiry to be made on the question of over-pressure. During this inquiry teachers should not be gagged, and it should not be assumed that all children at school enjoy perfect health.

There should be some definite encouragement to teachers to allow children to progress at their natural pace, rather than a direct encouragement to present all children for examination.

It is true there have been a few slight concessions made lately, but they do not go far enough. We hope the Education Department will introduce such further modifications in the Code as shall enable the country to obtain the largest measure of intellectual and moral benefit with the smallest amount of physical mischief. Something must be done to check the system of Labanism which is growing on us. Formerly, it was necessary for a child to have attended 250 times during the school year to be eligible for examination. This safeguard against over-pressure has been removed. Now, every child whose name has been on the books for the last twenty-two weeks of the school year must be presented to the inspector for examination, although he may not have been present once during the time. In agricultural districts the period during which a scholar may be excused from school by the bye-laws varies from three to six months, but his name must not be removed from the books

unless it is known that he has finally left the school. This interpretation of a clause sits as a nightmare on teachers, and it can be easily imagined that an irregular child, becoming disgusted with the excessive attention he receives when he does attend, becomes still more irregular, and thus a bad matter is made worse. It may be answered that the standard of progress has been fixed with reference to the capacity, not of the bright, nor even of the average child, but of a scholar of only moderate ability. If such were the case, a bright child would be able to master the six years' curriculum in three years. Every practical teacher will say this is absurd.*

The pressure comes especially on children in the lower part of each standard, and it is for these we ask and must get relief. It may be said that the Code contains provisions for withdrawing these children from examination. But we know that these provisions are often overruled by inspectors. Many of them frown down attempts to withdraw children from examination on any terms. What would that inspector who, with an experience of twenty years, had never known a case of over-pressure, say to the withdrawal of any children because of weak health or defective intellect? Or what would that inspector say who wrote the school report from which the following is an extract: "The school is a good one, even when I take into account the large number of proposed exceptions. Teachers do not seem to be aware that these exceptions necessarily lower the merit of the school. A school like this can only lose by multiplying its exceptions."† The mistress asked for the *withdrawal* of ten delicate and five dull children. Twelve were allowed (3·8 per cent. in a new school on 312 examined), and the

* Although it has been my indirect interest to advance the brightest of my scholars, I have never ventured to force a boy through his six standards in less than five years, i.e., no boy has had more than one double remove in his school career.

† On the day of examination there were twelve children absent. Eight were ill (certificates produced showing reason of absence), two were in the country, one had removed from the neighbourhood, and *one was a* Jewess (holidays). Over these the teacher had no control.

above comment was the result. It is mockery to say teachers have power to withdraw a reasonable number of children from examination. If in the school to which I have referred some of the delicate and dull children have lately been over-driven that there may be fewer if any withdrawals at the next examination, where rests the responsibility? But it may be said that now the number of withdrawals is not to affect the merit grant. We may escape Scylla, but we have Charybdis in the instruction to inspectors, which says: "In a school in ordinary conditions exceptions (withdrawals) should be very few." (No. 64).

Teachers ask for real liberty of classification of their scholars. You are told they have it. Now this is an inspector's idea of "a liberty." A child, say, nine years of age, and ignorant even of the alphabet, attends a school for the first time. It is a "liberty" to the teacher to present the child for the first time in the lowest standard for examination! Tell a teacher that the Education Department has granted that the classification shall be not according to age but according to attainments, and you will raise a smile expressive, not of unqualified assent, but of sorrow for your credulity. Tell a teacher that there are to be no more examinations for four-year olds, five-year olds, and six-year olds, as such, and you will receive for an answer, "Poor little souls—what new torture is in store for them!"

There would be some real relief to the delicate and dull if the maximum grant to schools were paid for passing considerably less than cent. per cent., but we must not hope for this, for we are told, in effect, that a rooted aversion to work—the strongest characteristic of the human mind—is developed in elementary teachers in a marked degree.

Substantial relief would follow from diminishing the requirements of the Code, especially in needlework. I believe that the work, even for the brightest children, when working under favourable conditions, is almost too great to be done thoroughly.

Teachers would be relieved from a great deal of mental anxiety if the examination results depended on conditions

which were less uncertain. This could be secured by greater fixed payments for attendance, and less on examination results.

If I were reviewing the Code as a whole, instead of its great blot—excessive requirements—my views would not be so pessimistic, for I believe that, as an educational influence for the brightest of our children, it is superior to its predecessor.

Teachers believe that it is not to their interest to exaggerate the results of over-pressure, and they have no wish to make capital out of the question. They do not wish to play into the hands of the opponents of education, of the opponents of School Boards, or of any political party, but knowing, as they do, how much preventable suffering there is in their schools, they feel that a silent and, inferentially, an acquiescent policy would be despicable. They desire to see knowledge extended, intelligence quickened, morality deepened, and the school-lives of all our children made happy.

DISCUSSION.

Dr. CRICHTON BROWNE, F.R.S., said: It is quite certain that we owe a deep debt of gratitude to the human skull, that bony casket, for the shelter and protection which it has so long afforded to that delicate organ, the brain; but perhaps we owe it some little grudge because it has become too much identified in the popular language and conception with the brain itself, and has led to the idea which seems to prevail in some quarters that the brain is like the skull, a hard bony structure which will stand much carving and polishing, and will endure a large amount of pressure without detriment. It has often occurred to me that if educationalists could peep through a little hole in the skull, and see the living, throbbing brain, and realise that

it is a pulpy organ of about the consistence of calves'-foot jelly; if they could look at the minutest shred of it under the microscope, and admire one little galaxy out of the millions of starry cells that it contains, lying scattered amongst the strands and sources of its fibres, like a swarm of fireflies tangled in a silver braid—if they could, as physiologists can, picture to themselves the functional activity of the brain, now, as at times of ease and abandonment, shimmering over its surface from point to point; now, as at periods of calm and connected thought, localised into a steady glow in certain regions; and now again, as in moments of intense mental application, concentrated on one spot into a spark of surpassing brightness—if our educators could do all this, and if they could become practically acquainted with the brain, instead of having a mere hearsay knowledge of it, they would, I think, be more careful in the handling of it than they sometimes are, and be a little less ready to deny that there is any danger of exerting over-pressure on this delicate structure.

It is impossible, I fear, in the brief space of platform existence allotted to me to say anything which is very instructive or very conclusive on the great subject of over-pressure. I should have liked to have pointed out to you various methods by which over-pressure is brought to bear, and the various effects which it exerts on children in secondary and elementary schools, its incidence in the former being on the clever children, and in the latter on the stupid ones. I should have been glad to have traced out the connection of over-pressure in elementary schools, as taken by results, with the total disregard of the different rates at which mental growth goes on in different individuals and with the diseased and starving condition of many of the children in the elementary schools, but I must put these tempting themes asides, and confine myself to the proposition which has been put before you. And even as regards that I cannot hope in the time at my disposal to afford you anything like demonstrative proof. To do that I should have to enter upon elaborate statistics, and arguments founded upon them.

Permit me just to say, however, that, having conversed on this subject of over-pressure with members of the medical profession in every part of the country, I have not yet met with one who has not seen in his own experience and practice instances of its evil effects, either upon teachers or children; and it is a remarkable fact, and one which I would ask you particularly to note, that many of the medical men with whom I have conversed on this subject have told me that they have seen cases in which educational over-pressure has been one factor—not the sole factor, but still a very considerable factor—in the production of a very fatal form of disease of the brain known as acute hydrocephalus, or water on the brain. Now, in almost every case of alleged death from over-work in schools that has been brought before Parliament, the assigned form of death has been acute hydrocephalus, but the answer has been invariably that over-pressure had nothing to do with it, other factors in the complex etiology of disease being selected and emphasised; also that it is futile to bring forward solitary individual cases of the kind in face of the great fact revealed by the Registrar-General's returns that the mortality from acute hydrocephalus has been declining since the Education Acts came into operation. That statement is quite correct, and it is a very startling and telling one until more closely examined. It is quite true if we take the total deaths from acute hydrocephalus during the last twenty years, and calculate the percentage year by year, we shall find that the mortality from that disease has been diminishing steadily; but if we go a little further, and take the total number of deaths from acute hydrocephalus and divide them into two groups, that is, of infants under five years of age, and then of young children and persons up to the age of twenty, we shall arrive at a very different result. We shall then find that whereas up to five years of age in infants the death-rate from this disease has been going steadily down, the moment we touch that point where education commences and chiefly takes place, the death-rate begins to

go up, and continues to go up during the education and *post*-education periods. Now, the decrease in the death-rate from hydrocephalus in infants under five years of age is, of course, easily explained by reference to the great attention paid to infant-feeding and domestic sanitation in recent years. It must be borne in mind that children and young persons have participated in the benefits of improved sanitation, at any rate; and how comes it, then, I would ask, that they are dying in a larger proportion than they used to do from acute hydrocephalus? Must it not be that some new factor conducing to that disease is coming into play? And upon what new factor can we fix at all adequate to explain this result, except the education which has been so widely diffused of late years, which, when injudiciously pushed, induces a state of irritation of the brain which, in weakly, sickly, badly-nourished subjects, is very apt to pass over into inflammation of a low and insidious type conducing to acute hydrocephalus? A searching investigation, I am confident, will reveal the fact that the mortality from all those diseases that we are able accurately to distinguish in the Registrar-General's reports, is increasing at a rate which may be called alarming. A searching investigation will reveal that insanity is increasing with all those minor nervous ailments that do not directly kill, and so do not figure in the Registrar-General's reports, but which in after-life are developed into hay-asthma, St. Vitus's dance, and neuralgia, which are also increasing very rapidly. It would be preposterous, of course, to lay the cause of all this at the door of education. The increase and preponderance of nervous diseases, and the mortality from them, must be attributed to the conditions of modern life as a whole, to the development of civilization, which has transferred the strain of life from the muscles to the nerves, and set up these degenerating tendencies against which Mr. Herbert Spencer has warned the American people, and which we shall perhaps have to reckon with on our own shores one of these days. It is to the pressure of modern life as a whole that we must attribute the increase of nervous disease that is

going on; but depend upon it one of the most active and important elements in that pressure is education as now conducted. Nothing can be more influential in inducing that nervous temperament out of which diseases grow than forced or injudicious education. Given any kind of baby you like—one active and vigorous as a young tiger, or staid and stolid as a bumpkin—and I will undertake to say that with a few years spurring, cramming, and examining, it will have a nervous temperament developed in it, and be brought into a state of nervous agitation in which it will be as fidgety as a flea, and as explosive as dynamite. I do assure you that the manufacture of artificial nervousness is going on on a large scale all around us. Visit a few elementary schools in the poorer districts of London, and you will find that in those schools upwards of 40 per cent. of the children suffer from habitual or frequently recurring headaches, which increase in frequency from the lower to the higher standard of the school, finding their maximum in the seventh standard amongst the most intelligent and highly educated children, and which occur in a large majority of cases in those afternoon and evening hours, when, as Sir Joseph Fayrer has just stated, the brain is exhausted and fatigued. And you will find in those schools not only an overabundance of headaches, but an enormous quantity of sleeplessness and of somnambulism, neuralgia, and other nervous affections, of which the happy days of childhood ought to know nothing. I cannot offer to prove all this now. I have offered to prove it elsewhere, but I will beg all who have the opportunity of doing so to make a few inquiries for themselves, and you will, I think, arrive at the same conclusion with me, that education as now conducted has an all-powerful tendency to induce a nervous temperament, and through it to lead up to nervous disorders, and even to nervous diseases, which are sometimes of a fatal character. I see that the teachers are included in the proposition, and I should have been glad to have said something on their troubles and difficulties in connection with the subject of over-pressure. About pupil-teachers I would

say this: that the burdens laid upon them have been of the most oppressive and grievous character. Were I to state to you the number of hours that these pupil-teachers—mere boys and girls—are called upon to devote to teaching, being taught, private study, over-work; the hours far beyond anything that reason could approve, beyond the utmost limits even sanctioned by the indentures under which they are serving their time; to describe to you the circumstances under which they do their work, the number of hours they have to stand on their feet, the irregularity of their meals, their examination worries; to put before you only the most conspicuous of the evil effects of this style of life upon their health and spirits would, I am sure, elicit from you a strong and emphatic condemnation of the pupil-teacher system. I venture to assert that there is not one member of the Department, nor of the School Board, who will stand forward and defend the pupil-teacher system as it has been worked in recent years; and I will venture to point out to you that important abrogations and modifications are now being very quietly introduced into that system, so that the outcry—the futile outcry!—about over-pressure is already bearing some practical fruit. But we cannot forget that this indefensible pupil-teacher system, much in need of a reform, has grown up and been consolidated under the sanction and the fostering care of the Department and the School Board, and that not a breath of complaint was heard against it until those troublesome doctors began to cry out. Are we then in the new instance of over-pressure that arises to put implicit confidence in those authorities who have been responsible for this indefensible pupil-teacher system? Are we to credit them when they say to us, Whatever may have been the case as regards pupil-teachers, we have the children all right? I should say "No." I should say to those authorities, It is quite evident that with the best disposition in the world you are not exactly safe guides on this question. Your attention is so much absorbed in educational and pecuniary matters, in your percentages of passes and grants; your

attention is so riveted on the great central movement of this vast national work that you are most jealously superintending, that you are blind to some important collateral considerations; but these collateral considerations involve questions so closely and intimately affecting the national health that they are not to be trifled with. Speed is all very well, but we must not break our axle-cranks in attaining it. We must give to the educational authorities the benefit of a little physiological insight and a little medical assistance; we must, above all things, inquire thoroughly into what you are doing; and that brings me to what I trust will be the practical outcome of this Conference, an urgent and pressing demand for inquiry into the subject. It is inquiry we want; and I think some very suggestive inferences may be drawn from the fact that it is they who allege that over-pressure exists who are demanding inquiry, and those who deny its existence who are refusing it; and it is they who allege over-pressure who are calling for the publication of the evidence upon the subject, while it is they who deny it who are reluctant to publish anything about it. Only quite recently the London School Board rejected a motion for a committee of inquiry into the subject, and I need scarcely remind you of the great reluctance of the department to incur the expense of printing documents bearing on this subject. One word in conclusion. We who, from a sense of public duty, have spoken out boldly upon this question of over-pressure have been represented as the enemies of education. On my own part, and on the part of the medical profession at any rate, I would repudiate that accusation most thoroughly. No one can know as well as medical men do the benefits which flow from real education—from knowledge, from discipline, self-respect, and self-control inculcated in early years—but no one can know as well as medical men do also the evils that flow from spurious education and the presumptuous and foolish interference with the laws and course of nature. What we want is real education, a true comprehension of the meaning of the term, and the

preservation of a just balance between the different processes that are included under it. We object, as I think Mr. Brudenell Carter has hinted to us to-day, to the appropriation of the term education to mere schooling, for we know that that is practically the least important part of it; that the most momentous parts of the education of every man and every woman are those that are learnt out of school; that were carried on before the first schoolmaster was invented; in the union between nature and the family in the employment of the senses and the active powers. We desire to gratefully acknowledge the vast advantages that mere schooling properly conducted may confer on the pupil, and to eliminate from it certain deleterious ingredients that have been mixed up with it, and that threaten to mar its usefulness. We desire a healthy education, not artificial cultivation; and we desire the genuine article, not a mere sham, scamped in its construction and made of terribly adulterated material. We desire to be able to represent education to ourselves not as a Fury with flaming eyes and scourging hand, relentlessly driving up a crowd of sickly, feeble, footsore children, but as a smiling Naiad, leading with kindly care an eager and joyous band, by pleasant paths, to the true fount of wisdom.

Mr. C. KEGAN PAUL said: When first asked by my friend, Mr. Pearce Gould, to take part in this discussion, I was not at all aware how important and formal it was intended to be, nor even where it was to be held. But I have not felt it right to shrink from saying a few words on which I claim to have some practical knowledge. I was for eight years master in college at Eton, in charge, with special reference to their health and domestic life, of the seventy boys on the foundation, elected by competitive examination. Then, living in the country, I was practically, though there was a nominal Committee, the sole manager of a village school under Government inspection for twelve years, and, more recently in London, I have been manager of a group of schools under the School Board.

It would be difficult to draw up propositions more mis-

leading and equivocal than those submitted to us to-day. There is in them no attempt to state with precision what class of schools is intended, whether one or all, public or private schools, those for the upper classes or the poor, under or not under Government inspection. There is in them an assumption wholly unwarranted, as I believe, that among persons, not specified, who have to administer education, "a semblance of knowledge is more highly valued than real intellectual development;" examinations are condemned, but there is nothing to show that the framers have any thought of the vast differences in kind between test and competitive examinations; there is a sweeping assertion that the hours are too long, though they vary widely in Board Schools, Public Schools, Grammars, and College Lectures. Work out of school is assailed for children of tender age, while that age is undefined, and no attention paid to the small time actually spent in school, as at Eton. "So-called education" is named with a vague scorn, like that of the curate who objected to the "so-called nineteenth century;" and the general impression left on the mind of the reader is, that whoever framed the propositions objects to any but a very low standard of education, and to all attempts to enforce it on society, because a child or two has an occasional headache.

Mr. Pridgin Teale has somewhat narrowed the question in his interesting paper, in which he has referred almost exclusively to Higher Schools for Boys and Girls, with a side glance at the Universities. I will limit myself to the same, and first give my personal testimony. It is admitted that the standard of work at Eton among the Collegers is very high. The competition to get into college is severe, so is that at the end of the course for the various scholarships, which are the prizes awaiting a clever boy. In the years I was master in college I never knew one single lad break down from over-work; and at the present moment the health of the collegers will stand any comparison, however close and searching, with that of the oppidans, or of boys at other schools. I call to mind the companions of my

own college days, and while I remember many whose sun has set prematurely, none who were distinguished as hard workers were or are any the worse for their work.

Even in Mr. Pridgin Teale's paper there is no real discrimination between competitive and test examinations. Let us carefully distinguish. No one, I take it, would wish to go back in the distribution of scholarships, bursaries, appointments of all kinds, to the old and evil system of nomination; if any do wish it, the thing is impossible, and we must bow to the logic of facts. There is no way of selection but the competitive examination, and with all its faults it does bring the ablest, the strongest and the healthiest to the top, and those are the persons wanted. No one would deny that they might be bettered, and especially by being made more general, so as to increase culture all round rather than special knowledge, but this would not decrease the pressure of preparation. Competitive examinations being the only way of selection, the more candidates there are the more searching and the more difficult must they grow, and the fault lies not in the examination, but in those who submit to them unfit boys. In a competitive examination at Wimbledon for the Queen's Prize, a man who goes in with defective sight is merely silly, and so is a boy, or his parents are for him, who goes in for a prize for which he is physically or mentally unfit.

But with test examinations the case is different. I quite agree that those prizes of books and the like, which turn a test examination into a quasi-competitive examination, imposed on a whole class, and when there is no need for it, are mischievous. The simple aim ought to be to discover how far the pupil has used his talents and profited by the instruction given; it should be conducted by persons apart from the school, and without hurry. Why is it as a rule that boys educated at public schools, and girls too, can use their knowledge better, and if they have any learning are less priggish about it than those educated wholly at home? It is because examination has taught them their imperfections and the relativity of all knowledge. Once more, as

a personal testimony, I have never known a boy break down when studying for a mere school examination.

With regard to superannuation, no doubt it bears hard on individuals. But they must yield to the general good of the school. The superannuated do not break down in health; they are sturdy stupid lads who are usually blest with abundant health, and who clog the school machine. From the lads who do not or cannot work, who fail in their removes, and remain big louts among bright little boys, comes, as every schoolmaster knows, a very main portion of school immorality. It is necessary to eliminate boys who clog the school, and the only way is the superannuation test.

Sir Joseph Fayrer's very interesting paper would take me into matters beyond my province or capacity if I said more than one word on it, which is this: The habits of schools are very various; some enforce preparation in schools and give facilities for it, some give shorter school hours properly so called, and have a time set apart for preparation in another room under the master's eye, as, I think, at Winchester; some give lessons at home as a supplement to short school hours. It is plain that no general rule against home lessons can be considered apart from these facts. With all that he says of the evils of pressure on immature boys and girls we must all of us cordially agree.

To sum up. I wish sincerely that our friends the doctors would be more precise; they are, I believe, well-wishers to education and to literature, but they are disposed to over-value health. Even if it be granted that absolute health is incompatible with the higher education, which I do not grant, most of us would willingly pay a little for our intellectual gains.

But on the general question to society, if the alternative given us is: Will you have a healthy set of athletic young barbarians, without an ache or pain, but also without an idea; or, on the other hand, an educated set of fairly healthy persons, able to enjoy the exercises, mental as well as bodily, of life, tempered with a few cases of failure and over-work?—and these as, I believe, very few, the answer

of most would be: Give us the education, and let us take our chance.

Mr. T. MARCHANT WILLIAMS said: That over-pressure exists in our public elementary schools there cannot be a reasonable doubt, but each day's official experience confirms me in the belief that, so far as the children are concerned, the over-pressure that chiefly affects them is that which arises from sheer want of the necessaries of life, viz., food, clothing and fresh air. Of course there are many teachers in both public and private schools who, being unskilled disciplinarians, and unversed in the ways of children, as well as ignorant of the fundamental laws of mental development, and of the approved methods of teaching and training that are based on these laws, subject their pupils to needless mental and physical pressure; but *this* over-pressure has existed, and always will exist, in a greater or less measure, so long as schools exist and teachers find their way into them inadequately equipped with knowledge, and judgment, and professional skill. This, however, is not the over-pressure that is so vigorously and loudly decried in these days—the over-pressure of the day, so to speak, is that which is supposed to be due to the present rigid and mechanical system of "payment by results," and the eager and heedless pursuit after high percentages and large grants without regard to the present capabilities of children or their future wants, which is the natural outcome of the system. *This* over-pressure is usually over-estimated, and the outcry against it is misdirected. That it exists to an appreciable extent I freely admit; that it ought to be removed, and can be removed, I also admit. But I contend that this is not the over-pressure that chiefly affects the children of our Metropolitan Board Schools. They suffer mostly from too little food, clothing and fresh air, and not from too much instruction; from too few home comforts, and not intrinsically or necessarily from too many school lessons. A large proportion of the ill-clad and ill-fed children that crowd the public elementary schools of the metropolis are not in a fit state, either physically or in-

tellectually to receive the instruction that is prepared for them, and the training that is intended for them; and if our teachers are sometimes unmindful of this fact, they are to that extent *indirectly* responsible for the over-strain that necessarily arises from the oversight.

The system under which they work compels them in a measure to assume that the mental and physical capabilities of children are fixed and invariable quantities, and to impart in their schools the instruction that best accords with the wants and powers of well fed and well clothed children of average intelligence. The system is not sufficiently elastic to enable the teachers to adapt their programmes to the special environments of their schools; hence there is over-strain, for which the present Code system of assessment and reward according to a fixed scale in common with the teachers, is *indirectly* responsible. But, let me repeat, those who are *mainly* and *directly* responsible for the pressure that weighs unduly upon the children of our schools are the parents, who crowd the bars of the public-houses that surround every school and flank nearly every street, and spend there the money that ought to be spent in providing their children with the food they do not eat, and the clothes they do not wear.

I need hardly point out to those who are in the least familiar with the working of our educational system, and with the management and organisation of our public elementary schools, that both the pupil-teachers and the head teachers are, like the children, subjected to intolerable strain and worry. The latter we may assume for the present, to be able to take care of themselves; if they are not, they have themselves to blame I should say. The former, however, are young and are as helpless as they are inexperienced, and are therefore deserving of our keenest sympathy and readiest assistance.

The pupil-teachers in the service of the School Board for London begin their professional career at the (minimum) age of fourteen or upwards. The term of their school apprenticeship extends over a maximum period of four years.

Throughout this period their work is exceptionally trying to them, for they have to devote thirty hours a week to class teaching and as many hours as they can snatch to the furtherance of their own studies. At the end of each year they have to pass an examination in the fundamental and other subjects of school instruction, and the *one hour* per day which the head teachers are supposed to spend in assisting the pupil-teachers with their studies and in supervising their preparation for the examinations, is generally that which immediately follows the morning's class teaching, when both teachers and taught are so weary and fatigued that instruction cannot be efficiently imparted or usefully received. Hence one might with much truth say, that the great majority of the pupil-teachers in this country have to rely mainly upon their own resources for their advancement in general and special knowledge, and also in practical skill. In Liverpool and in one or two other large provincial towns, a carefully planned scheme for teaching and training pupil-teachers by skilled specialists has been for some time followed with most striking success. In London, too, the School Board have practically recognised the exceptional difficulties under which pupil-teachers work and the excessive strain to which they are subjected, by establishing classes for them at convenient centres, under the superintendence of a large staff of specially qualified teachers. This Centre System, as it is called, has been a success. It has undoubtedly improved the general intelligence and knowledge of the pupil-teachers, but, unfortunately, it has not served to lessen very materially the pressure to which they are, in the nature of things, subjected. They still have to work in school for thirty hours or more a week; and when it is borne in mind that this work really means the disciplining and instructing of large classes of forty, fifty, or even sixty, half-fed and therefore restless children, the physical and mental strain it implies is unusually great. This pressure *must* be lightened, nay, removed; hence the Board are about to adopt a further extension of the Centre System, which, once it comes into

full operation, will rob the cry against over-pressure, in so far as it concerns the pupil teachers of the Board, of nearly all its force and truth. According to the new system, which, I trust, will be passed for adoption before the end of the year, no pupil-teacher will be allowed to take part in class teaching or in any school work whatever for more than twelve hours per week, that is to say, three hours per day, and all pupil-teachers will receive their instruction at central classes, each of which will be under the superintendence of a permanent head teacher, assisted by a staff of assistants of experienced ability. The evening studies of the pupil-teachers will be greatly lightened by this plan, for every teacher will receive a half-day's instruction at the Centre every day of the week, Saturdays included. The junior pupil-teachers, and possibly also the seniors, will have one half-day per week in addition to Saturday afternoon, free from work and study. It is only those that are familiar with the way in which the pupil-teachers of the School Board for London were, until recently, trained and taught, and in which the pupil-teachers of most Voluntary and Board schools are still taught and trained, can adequately realise the importance of the step that is about to be taken by the Board, and the benefits it must eventually confer upon the pupil-teachers. It is easy to be wise after the event, and it is easy therefore for me and others to be overtaken by a feeling of astonishment that the pupil-teacher system, in its unimproved state, has been tolerated so long. It is by no means an uncommon sight to see in our schools a class of children too weak and weary to sit still, let alone to listen and to learn, and in charge of them an equally weak and feeble growing boy or girl of fourteen or fifteen, vainly striving to cram into their little heads a few uninteresting facts and meaningless words. I ought, indeed, to go so far as to say, if I am to be in perfect accord with the truth, that this is a sight that meets my gaze nearly every day and in nearly every school. The pupil-teachers do their best, I admit; but the admission necessarily means very little from my point of view. They do not quite under-

stand the ways and temperaments of their pupils, they have not mastered the approved methods of teaching them, they are not equipped with much full and accurate knowledge of the subjects they teach, they have no time or inclination to prepare their lessons, and if they had time and inclination and strength to do so, the lessons could not be properly revised by their head teachers, whose hands are always full of other work, and whose heads are always full of percentages and grants,—and yet these young people are ever most keenly conscious of the fact that the official assessor of the Education Department, in other words, H.M. Inspector, will expect definite *results* at the end of the school year, in the shape of passes in reading, writing, arithmetic, and many other subjects, and if these results are not forthcoming, grants will be withheld, parchments will be disfigured, and pupil-teachers will be censured, or even called upon to resign. And what is the outcome of all this? Teachers break down one after another, and those who might take their places wisely seek less remunerative and trying situations; hence it happens that, at the present moment, the School Board for London, notwithstanding the high salaries they offer, have a large number of vacancies in their schools for male and female pupil-teachers unfilled! The new system which is about to be introduced will, doubtless, effect a change for the better in every respect—will relieve the pupil-teachers of the over-pressure of which they are now the victims, will greatly raise the level of their intelligence and attainments, and will thereby also increase the general efficiency of the schools. It is but right and fair to add that though the School Board for London have been somewhat slow in devising a plan for relieving their pupil-teachers of the overwhelming pressure of their work, they have always admitted and deplored its existence, and have always evinced a genuine desire to have it removed. They have at last matured a plan for effectually removing it; and it becomes the duty of those who are interested in the welfare of these young people, who are destined to be the future head-teachers of our public elementary schools,

to see that some such plan as that which the London Board have devised for their instruction, shall be adopted in all schools.

Dr. FARQUHARSON, M.P., said they had received a great deal of very valuable information in the excellent papers which had been read, but he feared if they tried to cram all they had heard into their brains the effects might be very similar to those they had met to denounce. One side of the question had been put very ably by Mr. Brudenell Carter and Dr. Crichton Browne, and they had also had the advantage of hearing some very excellent remarks from Mr. Kegan Paul, and it seemed to him they should try to take up some kind of judicial attitude, and see if any kind of compromise were possible between the conflicting parties—whether there might be exaggeration upon both sides. There had no doubt been exaggeration on the official side, because officials always looked at everything through a *couleur de rose* medium, and always considered everything was for the best. But might there be any exaggeration in the ideas of the doctors? That seemed to him more doubtful. They had heard from Mr. Kegan Paul that the doctors were not precise enough, but he would remind them that medicine was not a precise science. All they could possibly do was to lay down certain physiological principles which must be carried out by those who had the regulation of school machinery; and all must agree, he thought, in deprecating another remark made by Mr. Paul, that doctors, or indeed any one else, could over-value health. The great point to be considered was, were these bad results, which were undoubted, due to the educational machinery itself, or to the unfortunate hygienic conditions under which the machinery often had to be worked? There was no doubt that for the proper use and growth of the brain, like all other organs, a certain amount of work was absolutely necessary; and it was probably generally understood that when work was carried on under thoroughly good hygienic conditions there was very little actual grievance to be made out with regard to over-work. Hard

workers generally lived long; barristers, the hardest-worked profession, stood at the top of the tree as regarded longevity. He could also agree with Mr. Paul in some respects for following out the line of experience he gave in reference to a public school with which he had been connected; he could also give his experience of Rugby, with which he was formerly connected as medical officer for three years, and he did not think he was called upon to treat or consider more than a very few cases indeed of educational pressure or hard work. As a member of the School Board in Scotland, he might say the same thing; work carried on with plenty of good air and good food was not detrimental to children. But unfortunately very different conditions prevailed in large towns. There the children were working under very depressing and wretched conditions, with insufficient food, and often none at all before they began work; often working in bad air at home; and they had the great and crushing disadvantage cast upon them of those home lessons which all agree ought to be abolished altogether, or at all events very much restricted in quantity. Superadded to the other conditions they had the depressing effects of worrying anxiety connected with the examination and the visits of inspectors, who were too often looked upon, as he feared, as bogeys to terrify the children into greater industry. It was very easy to point out these evils, but much more difficult to suggest appropriate remedies. If you could give every child who came to a London Board School a good breakfast, or could carry out the excellent arrangements so admirably organised in Scotland by Lord Aberdeen and Mr. Campbell, M.P., by which every child was provided at an almost nominal cost with a substantial dinner in the middle of the day, then no doubt many of these evils would vanish away; but if they could not do that they must endeavour to adapt the circumstances to the conditions. If the children could not be fed properly, they must be educated on some plan which would not bring on them that over-pressure which was undoubted under the conditions in which they were com-

pelled to work. He could not pretend to suggest any exact machinery by which this could be done; they could only suggest principles, and bring pressure to bear on the proper authorities, and in that way he hoped this Conference would be of great benefit. He thought there should be more discretion given to teachers, who might be allowed to knock off a child's work for a day or two, or give him half lessons, and many other little points of that sort. Above all, they wanted a systematic medical inspection of schools throughout the country, for he believed these evils would never be removed until all the schools were visited regularly by scientific men, who could look round and see whether the ventilation was sufficient, whether the teaching was too much for the scholars; who could look at the individual children and see whether any over-pressure was being exercised upon them.

Dr. J. H. GLADSTONE, F.R.S., agreed that this subject was one of the very highest importance; and if some of the allegations which had been made were true it was necessary they should be looked into, and some of the educational measures changed, whereas if they were not true it was necessary of course that the public mind should be disabused of the fears which had been created. They would all feel too that they ought to look at this matter without personal feeling or bias, and try to arrive at the truth of the matter. He hoped every one in the room would value bodily health, without which no one could succeed in life, for it was well known that those who succeeded best even in intellectual pursuits were those who had healthy bodies, and in order that the children should be brought up well, and improved intellectually and morally, it was necessary that they should be physically educated too. His own knowledge on this subject was derived from two very opposite sources. In the first place he came in contact with a large number of youths who went up for competitive examinations for the Civil Service and the Universities, and on the other hand he had long served on the London School Board, and there-

fore knew its proceedings and the general estimate of elementary education in London. With regard to the first he was sorry to say he must fall in with many of the remarks with which Mr. Pridgin Teale commenced his observations. A large amount of evil was being done—not so much as was sometimes represented, but still a large amount—from competitive examinations, but it was important to draw a distinct and sharp line between test examinations and competitive examinations. Test examinations would scarcely injure any school, whilst competitive examinations, whether carried on in colleges, at school, at home, or in cramming establishments, seemed to him peculiarly fitted for producing much mental discomfort with the very least educational advantage. They were almost entirely directed to training the memory, and a very little indeed to training the intellect. He had seen many of the evil results in cerebral affections, insanity, drunkenness, and even suicide, which had been occasioned by them. But they must not be confounded with the ordinary examinations which must take place for choosing the right men for certain positions in life; such might be made test examinations, and need not be made so distinctly competitive as they now were. Many other matters also ought to come in, such as physical health and strength, besides the mere ability to answer a certain series of questions. With regard to the London School Board, he might say he had never been better satisfied with it than he had that afternoon, because, noting down the various recommendations made by previous speakers, he found that the London School Board had been attemping to grapple with every one of these questions which had been referred to. First of all the London School Board had no competitive examinations whatever. The only competitive examination was with reference to Scripture knowledge, which was quite voluntary, although most of the teachers and scholars went in for it, and of course for the scholarships which were given to them in award. Ventilation had been spoken of, and this was carefully attended to.

The children were brought into these Board Schools out of the streets, and out of badly ventilated homes, and all kinds of insalubrious conditions, and he could hardly imagine any change more healthy than into these elementary schools. Any one visiting such a school would see a wonderful difference in the children within a few months. Those who had been driven in by the action of the visitors were generally unkempt, ragged-looking children, scowling and disorderly; but if you went into the same school a few months afterwards, and saw the cheerful-looking, diligent and healthy children you would think they were a different set altogether, whereas they were the same children, only improved in health and appearance. There was much less disease in children under five years of age than there was previously, and there was also a greater diminution of disease in general amongst children over five years of age during the last ten years. Then, further, they had almost discarded home lessons, boxing the ears was entirely forbidden, and military drill had been introduced; payment by results was abolished, and fixed salaries given to the teachers; keeping-in after hours was strongly discouraged and almost forbidden, and as far as pupil-teachers were concerned, where if anywhere there was over-pressure, that had been long under consideration. The pupil-teaching system had had its advocates, its defenders, and its opponents on the London School Board, and the plan adopted had been greatly modified, and their position was now far better than formerly. He accompanied Dr. Crichton Browne in one investigation, when he asked those children who had headaches to hold up their hands, and they did so. A number of other questions were asked, bringing out a great deal of information, but he did not know what amount of discount ought to be taken from these statements. He could only say that the most important charge that was made of over-pressure entirely broke down when investigated; that was the only one which had been investigated. Still, notwithstanding all this, he had no doubt *that* connected with the pupil-teacher system there was over-

pressure which must be got rid of, but it must be remembered that legislation could only deal with a large mass. The requirements of the Code were not above the capacities of the majority of children, though there were some, especially those insufficiently fed and in bad condition, who could scarcely come up to it. On the other hand, there were those who were ambitious, and must be restrained. He thought all this should be left to the discretion of individual teachers. The School Board and Education Department had done all they could in this direction, and had almost gone out of their way to point out that managers must exercise an influence in this matter; and it was strictly laid down that the managers were held responsible by the Department for the conduct of their school, and for the care of the health of the individual scholars who, if necessary, should be withheld for examination.

Dr. LANGDON DOWNE said every one present at the Conference must have been struck with the wonderful accordance between the views expressed by the various speakers, and this very curious point came out in reference to those who doubted the existence of over-pressure in schools, that Dr. Gladstone, who had just spoken, whilst he defended entirely the School Board of London, said over-pressure took place in a stratum beyond the School Board. On the other hand, Mr. Kegan Paul somewhat startled him by the assertion that he had been for some time resident master in authority amongst the collegers at Eton, and that he never saw there any bad result from over-pressure. Now, he apprehended the cause of this divergence of opinion was that Mr. Paul had overlooked the fact that the over-pressure had taken place before the boys reached Eton, in the preliminary schools; and therefore his observations only had reference to the healthy and strong, who could endure that unnatural competition. Then one of the speakers had remarked that barristers were the longest-lived, but he surely could not mean barristers *en masse*; he meant the successful barristers, the men who became judges and Lord Chancellors; men who had large digestions, and

who could stand severe competition in their career. He did not reckon those who had fallen in the race, and had not achieved success. His own observations were entirely in accord with what had fallen from Dr. Crichton Browne, and if time had permitted he could give a variety of facts in support of his views. He had hit the nail on the head, and he hoped a good result would follow. They had heard from Dr. Gladstone that the position of pupil-teachers had been altered, the system of evening work, and that of payment by results. In fact the discussion which had taken place already had achieved some good results in these directions, and he had no doubt the discussion of that day would achieve further good results in the future, both with regard to the School Board of London and elsewhere.

Mr. ARTHUR MILLS said very conflicting opinions had been expressed, but to his mind they owed a great debt of gratitude to the medical gentlemen for what they had brought forward. As an educationalist he did not pretend to know anything whatever of physiology, anatomy, or the effect of over-tasks upon children ; he could only say that he listened with intense interest to these speeches, and particularly to that by Dr. Crichton Browne, because he supplied an answer to the statements which were constantly made that cases of acute hydrocephalus had decreased, whereas he had explained that within the period of school age they had increased, and, if that were indeed the fact, it was quite necessary that all who had anything to do with education should pay attention to it. It was all very well to say that he had not gone the right way to work in asking the children to hold up their hands. Archbishop Whately told a very good story about that question. He said that if you went into a room full of young ladies and asked all those who wished to be married to hold up their hands, not a single hand would be held up, but they would all want to be married. So in the case of children, he believed the tendency was to keep their hands down, and therefore all those hands which were held up might be a genuine proof of suffering heads. With very few exceptions there was a

general impression out of doors that there was over-pressure in schools. It might be very true, as Mr. Williams said, that a good deal of the suffering of the children arose from their physical condition, that they were ill-fed, and consequently unable to bear the strain of intellectual labour; no man could have been a member of the London School Board, and visited many schools and remain ignorant of that fact, apart from the circumstance that in some districts the state of poverty was so great as to prevent the proper feeding both of children and grown-up people. But that was not a solution of the question; they could not put down entirely to under-feeding or low physical condition the difficulties with which the children in the schools had to contend. He could not for one moment admit that the main fault lay with the School Board so far as London was concerned; he thought it rested with the Code, for in the North of England, where there were large schools, the same consequence resulted. When he was in the House of Commons there always used to be a standing fight over the specific subjects in the fourth schedule of the Code, and he was always trying to knock some of them off, because he did not think they ought to overload the children by cramming them with these subjects, but he always found that for every "ology" or "onomy" he could knock off the fourth schedule, his friend Sir John Lubbock would put on another at the other end, so that they did not make much progress in the diminution of subjects. What always struck him with reference to this point was that it was an unfortunate attempt to cram into children between the ages of seven and fourteen a lot of subjects which they could not be taught properly, and which caused this over-pressure, not only on the children, but also on the teachers. It seemed to him that the first thing to do was to try to modify and mitigate the Code so that there should be less pressure necessarily brought to bear on all schools than at present. Not more than 50 or 60 per cent. made complete passes in the three R's, and while he did not say they should limit themselves to the three R's, still, while they were so far

from perfection in standard subjects, he thought they could afford to let off a little animal physiology and some of those sciences which they were trying, but which he was quite satisfied they did not teach properly, and that the children could not learn. An instance had lately been brought to his knowledge by the Medical Officer of the Brompton Hospital of the pressure on pupil-teachers in the case of a female teacher who was of consumptive family, and she was certainly in peril of her life. She was now happily being looked after, but no such thing as that ought to be possible. Teachers could not always afford to give up their posts, and there ought to be some one to look after them, and see that they were physically capable of doing their work.

Mrs. GARRATT ANDERSON, M.D., said, as a member of the first London School Board, she thought it her duty bearing on this Conference to look into the evidence as to the fact of over-pressure as carefully as possible. She agreed with Mr. Kegan Paul in thinking that a good deal had been said which was really beside the mark, because what they wanted to know was not that over-pressure was bad, because every one admitted it, but whether there was any considerable amount of over-pressure either in secondary education or in primary. That was the point which seemed extremely difficult to find out, and it was quite probable that it would be well to have a commission or some inquiry into that question. It might simplify the question to begin by separating the question as far as regarded primary education from that of secondary, and with regard to the latter she would dismiss it in this way. If over-pressure existed in children attending day schools, for she did not believe it did in public schools, it was decidedly the fault of the parents. This was a point which could not be hammered into parents too often, and she would entreat all her medical brethren to remember that it was the parents who were to be scolded and lectured if children were over-pressed. It was not possible for any school organisation to be so minute as to estimate the amount

of work which it cost each individual child to do the class-work; the fault nine times out of ten was in a failure of duty on the part of parents in not taking care of the conditions under which the child did its home-work, that it had a quiet room, and that it did the work at a reasonable time of the day, and also in overloading the child with extra lessons, such as music, dancing, or drawing, which had to be done at a time when a reasonable parent would insist on the child preparing the home lessons for school. A parent ought to come down absolutely with his authority to say that a child should not sit up until one o'clock in the morning, and the story told by Sir Joseph Fayrer was a gross instance of direliction of duty on the part of parents. In the schools of the Girls' Day School Company the mother had to sign a solemn declaration that she would attend to the regulations with regard to the time occupied in home lessons, and if one hour and a half or two hours, which was reasonably required, were over-passed, or the particular time for each lesson were over-passed, that she would at once communicate with the head mistress. If the parent signed that declaration and did not do her duty, but let the children go out to an afternoon or evening party, and then begin work at nine and sit up till one, it was the parent who was to blame. If she were asked the amount of work which a child could reasonably do there were so many questions came in, and it would take far too long to answer. There was one point which all parents should carefully lay to heart, namely, that all children were delicate. She did not believe in delicate children here and there: they were all delicate, and extremely prone to disease, and to break down at the tender immature developing age; they all required a great deal of close personal attention, and if they lived at home it was their parents alone who could give it. With regard to primary schools very different considerations came in, because there you could not possibly have the parent interfering as they could in the secondary schools. If a parent took his child away

from one primary school it would have to go to another under the same Code, and therefore protection must be afforded in some other way. Now this protection to the child was shared really between the regulations laid down by the Department and the School Board managers. The regulations of the Code did not seem to her at all unreasonable, nor the rate in which the children were expected to advance. The standards were exceedingly moderate, and any child of the age specified ought to pass them without difficulty. With regard to what teachers complained of so much, having to present all children for examination, the managers had power to excuse children, and they could be re-presented in the same standard if they failed in two subjects or twice in one. With regard to the specific subjects, she thought the observations which had been made had been somewhat misleading. The objection was to the introduction of so many specific subjects, and it was said it would be better to attend more to the elementary subjects. Now the fact really was this, that no specific subject could be taught in any elementary school until the standard of passes in the elementary subjects—reading, writing, and arithmetic—was up to 70 per cent., therefore the very poor low school, with a great number of ignorant children, got no specific subjects at all. Again, no child could take any specific subjects at all until it had passed the fourth standard, and no child could take more than two specific subjects, however high he was. Therefore the utmost a child could be asked to do was to take elementary instruction in two of these specific subjects. Therefore the fact that Sir John Lubbock had added another subject or two did not at all increase the burden on the child. As a matter of fact, very few specific subjects were taken, as could be seen by reference to the reports of the London School Board. In one school, where the total grant was £463, which was very low, the amount earned in specific subjects was only £8, spread over the whole school. Each child above the fourth standard could earn 8*s*., namely, 4*s*.

each in two subjects, so that there could not have been very much teaching of specific subjects there. In another school the total grant was £1044, and for specific subjects £43; whilst in another, with £1088 total grant, the specific subjects was only £11. These figures proved conclusively that there was no considerable teaching of specific subjects given, at any rate, in the primary schools in London.

Mr. EDWIN CHADWICK, C.B., said it had been proved by the experience of teachers of the greatest eminence that the receptivity of children was exhausted in less than three hours of direct simultaneous close teaching such as they get in the elementary schools, and, that being so, all teaching beyond that was waste. That had also been shown by the experience of half-time schools, where the children actually got ahead of those in the Board School. He gave a prize to those who got first through the fourth standard, and it was found that the prize children got it at 7, the average attainment of the whole schools being 9½, whilst in the Board Schools and all the long-time schools it was 10. Mr. Mundella hoped he would get the children through the fourth standard at 10, but it was generally 11 and 12. Again, with regard to the Code, some of the best school teachers in London said that if they were left to their own devices in classifying the different children they would save two years of school time, and he was quite convinced that could be done, not only in London, but throughout the country. That would mean a saving of two years of five millions of children, and it would be a saving not only of time, but of money. Teachers themselves did not know the effect of over-pressure, but directors understood it, and it was proved by statistics, for the death-rate amongst school teachers was 20 per thousand, whilst in the army it was 6, in the navy 4½, and in prisons not more than 3. Again, by the last census there were 30,000 blind persons, and he had it on indubitable evidence that if attended to at the infantile stage, two-thirds of that could be saved. In America a great reduction in

school time was being introduced, and they were now aiming to get through the school teaching in about three years.

The CHAIRMAN then proposed a cordial vote of thanks to the gentlemen who had prepared papers, and also to those who had addressed the meeting. He hoped this would not be a barren Conference, but that all would go away somewhat better instructed than they came.

Conference on Wednesday, July 30, 1884.

SUBJECTS FOR DISCUSSION:—

7. "*Duties of School Managers in Relation to Epidemics, and Health of Inmates.*" By T. J. Dyke, M.R.C.S.
8. "*The Preventive Treatment of Infectious Diseases in Public and High Schools.*" By Alder Smith, M.B., F.R.C.S.

Dr. George Buchanan, F.R.S., took the chair.

The Chairman, in commencing the proceedings, said the subject of infectious diseases in relation to schools was eminently suited to such a Conference. Medical men, whose pecuniary interests were in subjects relating to health, were always claiming that those interested in education should give their assistance, and they would never be able to make the impression they desired on the public health until they got educationists working hand in hand with them, and teaching the doctrine of public health to everybody. On the other hand, those who were primarily interested in education must know full well what difficulties they had to deal with in this matter, and how, if they had not the completest state of health in the children they were teaching, those difficulties were increased, so that to them health meant facility of education, and without it they had a thankless task. The subject naturally divided itself into two parts, one of which would be introduced by Mr. Dyke, Medical Officer of Health for Merthyr Tydfil, and the other by Dr. Alder Smith, Medical Officer for

Christ's Hospital. Dr. Dyke would address himself chiefly to the question of infectious diseases occurring in the community as affected by the attendance at public elementary schools, whilst Dr. Smith would treat principally of infectious diseases as they concerned the discipline and the action of boarding schools and establishments of a higher class.

DUTIES OF SCHOOL MANAGERS IN RELATION TO EPIDEMICS, AND HEALTH OF INMATES.

By T. J. Dyke, M.R.C.S.,
Med. Officer of Health to Merthyr-Tydfil.

The subject on which the Committee have requested me to address you, has engaged considerable attention during the last few years; and more especially since Pasteur, in 1881, so clearly indicated the modes by which certain diseases were spread among animals, medical men have been led to enquire whether the initial cause of a febrile disease, such as scarlet fever, smallpox, or measles, may not be spread in like manner as anthrax among sheep and among cattle.

1.—*Epidemic Maladies.*

Epizootic maladies are admittedly known to be given out from the animals sick of them, and to be caught by other animals placed in contact with them. In the human race this "catching disease," by simple contact of persons infected by a specific fever with a person previously healthy, has been from all time an acknowledged fact.

Pasteur's discovery of the causes of certain maladies;

Tommassi-Crudelli and Kleb's demonstrations of the presence of a certain fungus in the water, earth, and air of certain localities where ague affected human beings, the proofs they advanced of the presence of that same fungus in the blood of the sick man at a certain stage of the ague attack; Liston's demonstration of the curability of wounds without any discharge, when the atmospheric air was excluded; Tyndall's demonstrations of the presence in the air around us of ("motes in the sunbeam") living seeds of minute plants; Koch's demonstrations of the important part played by these living spores in the affection of the healthy, and of their growth into living fungi—each particular one producing its own particular malady—each malady running its defined course, and in that course giving forth seeds which, in a fit subject, would germinate, grow, and produce a like disease. The work and labours of these illustrious men have now rendered intelligible the hidden modes by which maladies are engendered in the human body, by which their seeds, growing in the fluids and tissues of the sick person, ripen and form new seeds in myriads, which, being exhaled or thrown off, spread like disease in persons not previously sick.

Thus, then, the spread of specific febrile diseases, *by contact with the sick*, has been explained by the works of the true labourers I have named, aided by a phalanx of noble devotees to the science of Preventive Medicine, whose great object has been and is to save life by preventing the access of disease.

Let me illustrate the mode of diffusion of maladies in two or three ways.

A baker's boy has his coat "dusted" by a passing sweep—the immediate sequence would be vigorous resistance by the *white* boy and the thrashing out of clouds of soot from his *black* opponent's clothing. Any one standing by would, most surely, be covered by the mixed black and white dust, and would, while in the clouded atmosphere, inhale some thereof. If it should happen that the soot or the flour contained any material inimical to health, the inhaling

bystander would certainly take into his mouth, nostrils and lungs, some of the pernicious ingredient.

Pasteur has put on record the story of his having placed one sheep ill of anthrax among a flock of fifty sheep not previously ill. Those of the flock which had not been protected by attenuated anthrax virus were, within 48 hours, not only ill of, but died of that disease. How did these sheep become affected? It is not wholly impossible that the sick sheep might have rubbed shoulders with each of the other sheep, but remembering the results of the combat I have above cited, you will, the more readily, believe that the sick sheep may have sent forth from its body into the surrounding air, *something* that the previously healthy sheep inhaled, and that that something was the particular cause of this particular malady. Pasteur proved this, for he found in the blood of the newly-infected sheep the same minute fungus which existed in the blood of the sick animal introduced into the fold; nay, further, he found that by taking some of the blood thus infected by the presence of this minute fungus, and introducing it directly into the system of other sheep, that they also became ill of anthrax—just as, if you inoculate with smallpox, you produce that disease.

Tommassi-Crudelli has demonstrated the same sequence of cause and effect in the occurrence of ague to the labourers, who toil in the Campagna, at Rome. Inhalation of the air, or drinking of the water will induce ague—In the air, in the water, in the earth, at places in these wide fields, have been found a particular minute fungus—in the blood of the ague-stricken peasant drawn in the cold stage, myriads of like minute fungi were found. Guinea-pigs inoculated with this infected blood in due time showed distinct ague symptoms, and in the blood drawn from these animals the same fungi presented themselves.

It is to a consideration of this great truth I wish to fix your attention:—A person sickening for or sick of a febrile disease exhales, gives out with his breath, the seeds of that disease; another person, hitherto healthy, inhaling the

air in which those seeds float, becomes ill of that particular malady.

Substitute for the sheep the tender child of from three to seven, who having wearily wended his way to school, sits listlessly on the low bench. Rab is not well to-day. He leans his head on his boy-friend's shoulder, he shivers as with cold, is observed by the attentive mistress, and sent home with an elder sister. His boy-friend goes home that day, plays merrily for some days, then becomes ill of the malady Rab was ill of. It is the story of the sheep and anthrax, of the Roman peasant and ague. The lad caught his sickness from his friend Rab.

This illustration of the infectiveness of febrile diseases is the one I would ask you to fix clearly in your minds; the particular form of disease does not now matter, whether smallpox, measles, or scarlet fever, for each of these, doubtless, has its definite form of seed, as each has its definite group of symptoms; but in relation to the subject of the prevention of the spread of fever maladies in schools, I would ask you to regard these maladies as "caught" from a child ill of the disease exhaling with his breath the seeds of the disease.

2. *Schools and their Characteristics.*

Let me now pass on to consider very briefly the characteristics of schools, the building, the rooms, and the occupants.

The buildings of modern schools may be justly said to be models of what is desirable for the reception of many persons for many hours at a time—space is ample, as the requirements of the Education Department must be complied with; ventilation is efficient, as far as the removal of vitiated air rising to a certain level is concerned; but it has been frequently impressed upon my mind and my sense of smell, that there was in class-rooms, and in infant-schools especially, a certain portion of the room not so efficiently ventilated, that was where the desks and benches were so

placed as that the source of ingress of fresh air was from one to three feet above the heads of the children seated thereat and thereon. It was only when the door was opened, or the children were exercised, that there was any movement of and renewal of the air in those positions. It is in this still atmosphere, loaded with the exhalations from the lungs and the skin, that the chief provocatives of infection lies. Doubtless means may be found for the constant, yet gradual and unperceived, ingress of fresh air to the lower levels of all rooms in schools.

The *offices* of schools are necessarily used by children of all ages, and in this general use we have opportunities for the communication of infectious diseases, which might be diminished by the construction of these offices for each section and sub-section of the scholars instead of placing them in two, often adjoining groups.

The *ages* of the attendants at schools requires a few words of limitation, as I intend to speak mainly of those scholars who are under seven years of age. These are of two classes, those of seven and above five, who may be compelled to attend school, and those under five years and above three years, whose attendance is voluntary. Upon referring to the tables of mortality, extending in one district to over eighteen years, and in another over ten years, I learn that the heaviest rate of deaths from specific febrile diseases falls upon those who are of the ages cited above, from *three* to *seven* years. This, doubtless, is due to the fact that these febrile maladies are not constant visitants, but recur at periods more or less distant, and hence it happens that those who have passed their seventh year have, in the majority of instances, gone through the ordeals of whooping-cough, measles, and scarlet fever, while the younger ones have yet to undergo the fiery trial. It is for this reason that I have more especially pressed upon the Sanitary Authorities of the district I reside in the necessity of *first* requiring the *infant department* of schools to be closed during epidemics, inasmuch as it is those of the

infant-scholar ages who have not, as a rule, been ill of the maladies.

The *localities* whence scholars are drawn to attend schools vary necessarily in town and in country. In country districts the children come from hamlets wide apart, from isolated cottages, to meet in one common centre, and, as a rule, to spend the whole school-day together. In cities and in towns the distance traversed by children to school is less, but the admixture is greater, inasmuch as the school attended is at the choice of the parent, so the child from one house in a street may attend one school, while the child at the next house attends at a different one, but in evening hours they are probably playing in the same street. I do not think I need add a word more to show that schools are necessarily *centres* where children do congregate, and where equally necessarily they may "catch" maladies which are conveyed by contact.

The inferences I would draw from what I have read to you are threefold—

1. Specific febrile diseases are infective during the period of sickening.
2. The infectiveness increases during the developed stage.
3. This Infectiveness, though diminished, still continues during the stage of decline.

During the first and last stage, children affected are likely to frequent school; during the second stage they are, as a rule, confined to their houses.

As infection follows upon contact with a diseased person, so avoidance of such contact should mean non-infection.

The words I have just read express the *principle of action* I advocate—let me state very briefly the bases of facts upon which I ask you to concur with me. These facts I have learned while officiating as Health Officer in the Urban and Rural Sanitary Districts of Merthyr-Tydfil. The population would be about 66,000, the area about 75,000 acres. But ere I place the figures before you, I

must ask you to note that the usual period of *sickening* for scarlet fever is from 5 to 7 days; that for measles, 12 to 15 days.

In 1881 scarlet fever prevailed in many parts of the districts in the early part of the year; in June and July the numbers increased; in August a marked diminution took place; in September and onwards a continuous increase occurred. I noticed, at the time, that the diminution was coincident with the usual holiday period at the schools, and that when the schools re-opened isolated cases at first occurred, which were shown to have been derived from sickness at home. A sudden and severe outbreak occurred in the district immediately around one school—three school-children lay dead of the disease in a house opposite the school gate, all—young and old, mothers with infants in their arms, flocked into the one room to view the painful sight. The malady spread within 10 days severely. I advised the closure of the school—this was done on the 8th of October.

Within the first week after that day one scholar, and in the second week two scholars, who had attended school, were reported ill of fever. These were the only cases which occurred among this closely-packed population during the month the school was closed, and no other cases occurred subsequently.

In the same month, in another parish, scholars of another school were ill of scarlet fever. It happened that ten days' holiday were given at this time. It also happened that no other cases of this fever occurred in that village.

In another village, in October, 1881, 108 cases of scarlet fever occurred within 28 days. The school was closed on the 31st of October. No other case occurred there.

An epidemic of measles, in 1882, prevailed in six school districts. The infant department of four schools, and all the departments of two schools, were closed for one month.

During the 28 days previous to the closure there were, 221 scholars, 79 infants not scholars, and one person above 15, returned as being ill of measles—in all, 301.

During the 14 days *after* closure, 71 scholars, 39 infants not scholars, and five persons above 15 were reported to be ill of the disease—in all, 115.

In *four* schools out of the *six*, no pupils, no other child or person within the district of those four schools was reported ill of measles, during the second period of fourteen days. The disease had ceased to prevail.

In the fifth school, two miles distant from the nearest of the former schools, *six* scholars, pupils of the boys' school which was *not* closed, and *five* infants, members of the same households as those boys, were attacked by measles during the second fortnight. No other cases occurred there.

In the sixth school, in a village five miles from the last-named school, three infants, under two years, were attacked during this second period. No other cases occurred at this village.

In the districts in which school closure was effected, the disease ceased to prevail as an epidemic fourteen days after the scholars were dismissed, and wholly disappeared in 28 days after.

The population to which these statistics apply would number about 18,000. There were other schools in other parts of the parish which were not closed, and in those localities the malady continued to prevail for four and five months.

I could adduce other instances in which the same plan was adopted, and like success resulted. I trust, however, that I have said enough to convince you that by closing schools in times of the prevalence of epidemic maladies, such as measles, &c., the centres of infection being shut, the malady ceases to spread.

I will only ask you to listen to two examples of the results of dealing with contagious maladies in the usual mode, that is by only *forbidding* the attendance of infected or infective children.

At one school very many scholars were ill of scarlet fever. The master and mistress resided in the house attached to the school-buildings. Their children took the

disease, the parents continued to attend to their school duties, while nursing their sick children. The Sanitary Authorities refused to sanction the closure of the school. The disease prevailed in that village for many months, and carried off many victims.

Scarlet fever was very prevalent in 1881–2 in another locality, having a population of 21,500. The total of the deaths from the malady was 251. Closure of the schools was recommended—the Sanitary Authority declined to order it. The epidemic prevailed for eight months; the mortality of the children of the school-going age was at the rate of 20 per 1000, that is *one* out of every *fifty* of the children of the school-going ages—3 to 13 years—died from the malady. On further analysing the death-returns, it appeared that of the children of the infant school ages—3 to 7—the death-rate was 32 per 1000, or one out of every 31.

Contrast these figures with results obtained in the district I have spoken of, in which the schools were closed for periods of from 14 to 28 days: the death-rate of children of the school-going ages—3 to 13—was 5 per 1000; while that of the infant school-age was 3 per 1000.

The inference I draw from these facts is, that by keeping young children away from schools during the prevalence of infectious fevers, you diminish the spread of the disease, and lessen the duration of the epidemic influence.

Just as by forbidding the assembling of cattle, sheep, or swine, at markets or at fairs, when foot and mouth disease prevails, you prevent the spread of that malady to healthy animals.

As the outcome of my experiences, I would formulate the *use* of the closure of schools, as follows:

1. Whenever any scholars are ascertained by the master or mistress to be ill of any contagious fever, not only the affected children, but all the children from the same household, should be excluded from school for at least 28 days, in accordance with the principle laid down in the second part of the 98th

Section of the Minute of the Education Department, 1883.

2. If many cases of such contagious disease are known to be prevalent, then the Infant Department should be closed for 30 days.

3.—If, in the course of a fortnight after the Infant Department shall have been closed, scholars in the other departments have sickened of the same malady, then those departments should be closed for a like period.

The most ready method of bringing into practice the foregoing means of prevention would be—

To require the master or mistress of a school immediately to report the absence of children from school on account of sickness from an infectious fever, to the School Board, and to H.M. Inspector of Schools.

The School Board should direct the immediate application of the preventive measures authorised by the Education Department; and H.M.'s Inspector should ascertain whether those measures were duly carried out, and in case of neglect, inform the Department thereof.

The School Board and the Inspector should be empowered to require the assistance of the Sanitary Authorities.

It thus only remaims for those concerned with the education of children, to work heartily with the Sanitary Authorities, and the results will be, the diminution of febrile epidemics, the saving of child-life, and the lessening of human sorrow.

THE PREVENTIVE TREATMENT OF INFECTIOUS DISEASES IN PUBLIC AND HIGH SCHOOLS.

By ALDER SMITH, M.B. (Lond.), F.R.C.S.,
Medical Officer of Christ's Hospital.

MR. PRESIDENT, LADIES, and GENTLEMEN :—My subject is "The Preventive Treatment of Infectious Diseases in Public and High Schools."

Without spending time in preliminary remarks, allow me at once to state the *practical* precautions and regulations which the experience of fourteen years, at one of our largest public schools, has shown to be advisable.

We will first consider the means best adapted to prevent the introduction of infectious disease.

I must start with the assumption that our ideal school has been built in a healthy locality, that the general sanitary arrangements are good, that there is generally sufficient cubic space and good ventilation, that all soil-pipes are well-trapped and ventilated, that all the outlets to waste and overflow pipes discharge in the open, over well-trapped gratings, that the main sewer is efficiently ventilated, and cut off from the town drainage by well ventilated traps ; or that, in localities where there is no efficient sewerage, earth closets have been adopted instead of cesspools. All latrines should be detached from the main blocks, and no drains should pass under the basement of the school buildings ; also, if any sanitary repairs are necessary, they should be done during vacation time.

Dormitories should be kept clean and well aired ; and no dust-bins should be allowed, but the daily dust and refuse should be removed to a distance in boxes. Again, all gratings over trapped drains should be frequently flushed, as the water in the traps may dry up, and sewer-gas thus escape.

Too much attention cannot be paid to these matters, as sewer-gas, even when not charged with specific germs, produces a low state of health, which increases the malignancy of any zymotic disease that may occur.

Equally important is the water supply. If possible, an independent supply should be secured; but, whatever its source may be, it must certainly be above all suspicion; where there is any well-water used, it is advisable to have it analysed from time to time, and great care should be taken that no pollution occur from neighbouring cess-pools or drains. Neglect of these precautions may often lead to a disastrous outbreak of typhoid fever. The drinking water should be always drawn from a constant service, or from cisterns distinct from those used for sanitary purposes.

Then there is the milk supply: as milk has often been the vehicle in causing an outbreak of zymotic disease, it ought to be obtained from a dairy belonging to the school, or else from a trustworthy source.

Every large school ought to have its own laundry; if this be not possible, then great precautions should be taken to prevent infected linen from without being washed with the school linen; but, the only really safe plan is for a school to have a laundry of its own.

But, above all things, a large school should possess a good sanatorium, in which *all* cases of infectious disease should be isolated, no matter in whose house they may occur. There should be ample accommodation, with sufficient cubic space, and good ventilation; and, whatever the construction and arrangements may be, the fever wards, with nurses' apartments, bath, lavatory, and small kitchen must be *completely* isolated. If there are not two separate buildings, then the fever wards should be at the *top* of the infirmary, and approached by a distinct well-ventilated staircase (in which disinfectants can be kept when there is a case of fever) with doors at the top and the bottom.

If practicable, there should be a separate sanatorium for

scarlet fever; but it is not essential, as I know from experience that scarlet fever will not spread from the upper to the lower wards of a well constructed building, like the one we have at Christ's Hospital. If it were to do so, I should suspect that there had been some communication between the nurses of the two floors. In small schools and boarding-houses, there should always be a "sick-room" situated at the top of the house, and isolated as far as possible.

It is essential that one of the fever wards should always be in readiness; this can only be managed by constant supervision, and during the winter months it is necessary to keep it warmed. This may be effected by fires, but by far the best plan is to have hot-water pipes, which can be so arranged as to maintain the wards at a given temperature, and to keep the mattresses aired and ready for use. It is advisable to have a separate set of books and games for use in the scarlet fever wards.

But the most important precaution to prevent infectious disease from entering and spreading in a school, is *undivided medical responsibility!*

Therefore, one medical man, and one only, should have the entire school under his daily care and medical supervision. He ought to be responsible only to the governing body, and should have absolute power over the entrance into the school of all boys who have had any illness, or who have been exposed to infection, as well as over the whole arrangements for quarantine and disinfection. He should also have power to act immediately, if any sanitary reforms are urgently needed. Some public schools have no single responsible medical officer attached to them, but the several house-masters call in any medical man they prefer; and thus, with divided counsels and responsibility, serious mischief is likely to ensue from the neglect, or possibly even the absence of proper quarantine regulations. I wish to call special attention to this point, as the circular lately sent by the Council of the Medical Officers of Schools' Association to medical officers of schools, on the means

adopted to prevent infectious disease, elicited the following reply from a medical man attending one of the houses of a well-known public school :—

"I can, of course, only answer for myself and what I advise; some of the masters of houses are not nearly so particular as others, hence epidemics spread rather freely." Surely this quotation speaks for itself! And one, I trust, of the first recommendations of the Association of Medical Officers of Schools, which has lately been formed, will be, that every school ought to have one responsible medical officer, with full power to deal with infectious disease.

There is a point worth noticing in institutions where there are a large number of children varying greatly in age. In such cases it is advisable to have two establishments, one for children under eleven, and another for pupils over that age. By this arrangement epidemics (especially of measles) are generally restricted to the junior school; and thus the more important work of the senior and larger school does not suffer.

One of the chief means for preventing the introduction of infectious disease is to insist upon certificates on the entry of pupils, signed by the parents or guardians not earlier than the day before the admission; and stating, that to the best of their knowledge and belief, the pupil has not entered any house where any infectious disease has existed for at least three weeks (then should follow a list of all such diseases, so that there can be no mistake); and if this certificate cannot be signed, the child should be sent away to some house free from infection for quarantine, and his clothes disinfected at the end of the time. The infectious diseases the child has already had should be recorded on this primary certificate, and the papers kept for future reference; so that, in the case of an outbreak of fever, the medical officer can see how many children are liable to take the complaint. In large schools it is usual to examine each child on admission, when inspection

should be made of the vaccination marks, and re-vaccination should be insisted upon, unless the marks are good or the child has had small-pox.

During term-time, boys are very liable to take infectious diseases when on an "exeat." Parents should therefore be warned not to have their children home nor to allow them to enter any house where there is even a suspicion of any infectious disease. If a pupil happen to enter any infected house, quarantine should be rigidly insisted upon.

When pupils go home for their holidays, similar certificates should be sent to the parents or guardians, accompanied by a letter, stating that the certificates must be presented by the pupils *signed* on the return to school; and that if the pupil have been exposed to any infection during the vacation, *immediate* notice of the facts is to be sent to the school medical officer, and on no account is the pupil to return to school until permission has first been obtained from him. Those who return without their certificates (there are sure to be some) should be interrogated by the school doctor; and, if necessary, the telegraph should be employed. With regard to the length of quarantine that should be insisted on, when a pupil has been exposed to an infectious disease, it depends chiefly upon whether the school has or has not a disinfecting apparatus, which is certainly one of the most valuable things a school can have. The disinfecting oven should be large enough to take a full-sized mattress, and can be heated by a steam-jacket under high pressure, by fire, or by gas; but the self-regulating gas-oven is the best. If a school have such an apparatus, the quarantine should be a day or two longer than the longest known period of incubation of the disease in question; if not, the period should be still longer, as there is no definite time when the clothing is certain to be free from infection. Unhappy indeed, the medical man who is obliged to trust to home disinfection, and has to arrange when pupils may return to

school after having had, or having been exposed to, infectious disease!

I think the following quarantine times to be safe, *if thorough disinfection be carried out on the return to school*:—

Scarlet fever . . .	11 days' quarantine
Measles . . .	16 " "
Epidemic roseola . .	16 " "
Chicken-pox . . .	18 " "
Small-pox . . .	16 " "
Mumps	21 " "
Whooping-cough . .	21 " "
Diphtheria . . .	10 " "

I never trust to home disinfection, but invariably have the pupil washed with carbolic-acid soap, from head to foot, in a hot bath; and have clothes, books, *everything* exposed to a dry heat of *over* 212°, for at least one hour.

Again, a boy who has had measles or fever can, if necessary, be admitted direct into the school, when his body is not infectious, after efficient disinfection of his clothes. In fact, a good disinfecting oven is one of the greatest safeguards a school can possess.

Epidemic disease existing in a neighbouring town is often introduced by direct contact with the townspeople; and, if epidemic disease be prevalent, it might be advisable to place the town "out of bounds." Day scholars often bring infection into a boarding-school; therefore their parents should be specially warned not to send them to school if there be the slightest suspicion of any infectious disease existing in their houses, as I believe *all* infectious complaints may be communicated by the clothes of those who come into contact with infected persons. The suggestion, to keep the day scholars in separate class-rooms from the boarders, and to allow no communication between the two sets of boys when fever is prevalent, is hardly feasible. Cases of illness in the families of masters, or of all officials connected with the school, should be rigidly isolated; or, better still, the master or officer should live away from his house for a time.

especially if the case be one of scarlet fever. Again, all persons, tradesmen or otherwise, having access to the school premises should be bound to give immediate notice to the medical officer of the existence of infectious disease in their houses, and to abide by his instructions.

Next, we come to the actual treatment of infectious disease, should it unfortunately gain admission.

A case of scarlet fever appears! Probably the boy will be in the ordinary school infirmary, or the "sick-room," before the rash comes out; as, in all schools, boys with headaches, sickness, or sore throats should be sent there without delay; and it ought to be a well-known rule, that pupils are to report the slightest ailment *at once* to the matron, or the doctor. When the first case of fever is diagnosed it must be immediately isolated in the fever ward, which should therefore be always in readiness; and one of the ordinary nurses can be told off to take charge of it, or a fever-nurse be sent for. The next thing to do is to remove the bedding, books, and all the clothes that could possibly be infected, from the dormitory to the disinfecting chamber. Too much stress cannot be laid upon this. Notice should then be *privately* given to the matrons or others in charge of the pupils to carefully watch for any symptoms of fever, and to send any child feeling ill to the infirmary. With regard to scarlet fever, I believe it is not very often given to others till the rash is out, therefore there is always a much greater chance of stopping an outbreak of fever than of measles, which is freely communicated for days before the rash appears. To prove this assertion, let me mention that during the last fourteen-and-a-half years we have had twenty-five distinct outbreaks of scarlet fever; consisting of seventeen *isolated* cases, four sets of two cases, two sets of three, one outbreak of twenty-three cases, and another of thirty-three.

Twenty-three outbreaks were thus quickly stamped out, and though many of these boys were sleeping the night before the rash appeared in the dormitories, and some even went into school with the rash just coming out, the disease

did not spread. In 1880 I suddenly had ten cases in five days, then an interval of five days, and a second batch of thirteen cases in five more days. I need hardly say that great precautions were taken to quickly isolate the second batch; and we succeeded, as we had not another case! The only other outbreak we have had, viz., that of thirty-three cases, extended over a period of three months; and the longest period of incubation I ever traced was eight days.

After the case has been isolated, the "sick-room," or the room where the child was first placed in the infirmary, must be shut up and thoroughly fumigated with sulphur, before any other pupil is allowed to enter it, and the bedding baked; and, if any more cases occur, the same precautions should be adopted with each. Again, as of course the doctor's clothing can carry infection as well as that of other people, too much caution cannot be exercised by him. I am strongly of opinion that he ought to keep a large Mackintosh just outside the entrance to the fever-ward, near some volatile disinfectant, and place it over his clothes before he enters. Then, on leaving, he should thoroughly wash in disinfectants; while, if there be occasion to remain long in the ward, the face, head, and boots may be efficiently disinfected by using a steam carbolic-acid spray.

The nurses in the fever ward must be kept completely isolated from the nurses and servants in the ordinary infirmary; and the food, if not cooked in the fever-ward kitchen, should be placed at the bottom of the staircase (which should contain disinfectants) by the servants, and afterwards fetched by a nurse from the fever ward. Then the scraps should not be sent down, but should be burnt, and the crockery washed in disinfectants. In fact, great care must be taken that infection be not spread by the neglect of somewhat trivial matters.

Oiling the skin with carbolic oil is also a great preventive, and should be regularly done during peeling.

Next may I warn those in charge of the fever-ward to take care that boys do not throw paper balls nor letters out of the windows, in the hope of their reaching their schoolfellows;

as I have known boys attempt this. Lastly, all letters coming out of the ward should be baked before they are posted.

One of the most anxious and difficult duties falling to the lot of the school doctor, is the diagnosis and treatment of doubtful cases of fever. During an outbreak many children may come to the infirmary with simple sore throats. Such cases are always suspicious, as you may have scarlet fever without any rash, and it is often impossible to tell for some time whether the case be fever or not. What is to be done with doubtful cases? You cannot send a boy with only a sore throat into the fever ward, and if you miss a single case of slight fever and let the pupil return to school, he may be the unsuspected cause of a large outbreak. Only those who have experienced it can adequately realise the frequency of such cases, and the great difficulty of dealing with them. Of course the proper treatment is to isolate each doubtful case in a separate room and watch it. But this is often impossible, especially with large numbers. Under these circumstances I would advise all such cases to be placed in a large, well ventilated ward, in which a steam carbolic-acid spray is kept constantly acting; the temperatures can also be taken three times a day, any very suspicious case may be removed to a separate room, and, if necessary, isolated for a time to see whether peeling occur. At any rate, no doubtful cases should be sent back to the dormitories; and the clothing should always be baked. The bedding in the fever ward should be disinfected after each case of fever; and all soiled linen should be placed in some chemical disinfectant, and well baked before it goes to the laundry. Even then it ought to be boiled separately. Of course, all patients should be retained at the sanatorium until free from infection, and, before leaving, should be washed with carbolic soap (especial care being taken to cleanse the hair from scurf) and the clothes thoroughly disinfected.

After even a single case of fever the ward ought to be thoroughly fumigated with burning sulphur.

Schools having different boarding-houses ought to have

an ambulance, which should be disinfected immediately after removing each patient.

With regard to that most important question—When may a pupil who has had an infectious disease go home, or rejoin the school?

I think the following are safe rules to adopt, provided the patient and clothes are *thoroughly* disinfected.

A pupil may go home, or rejoin a school, after having had :—

Scarlet fever—In six to eight weeks from the date of the rash, desquamation having completely ceased, and there being no appearance of sore throat.

Measles—In three to four weeks, all desquamation and cough having ceased.

Epidemic roseola—In two to three weeks, according to the nature of the attack.

Chicken-pox—When every scab has fallen off.

Mumps—In two to three weeks from the commencement, all swelling having subsided.

Whooping-cough—When all cough has passed away, *or* after six weeks from the commencement of the whooping, provided the characteristic spasmodic cough and whooping have ceased.

Lastly, let me say a few words about the question of dispersing a school on account of an outbreak of zymotic disease. This is always a very serious step to take, and should in my opinion, *very rarely be adopted.* It often simply means distributing the disease all over the country, and perhaps causing deaths in many families. If two malignant cases of scarlet fever were to occur in quick succession, or a large outbreak, or a malignant type of measles, the first step to take is to give notice to the parents of the facts, and thus to give them the opportunity of removing their children, if they wish to do so. The onus of removing the pupils should rest with the parents and not with the school authorities, who should rarely go beyond advising parents to take away their children.

To *order* a school to be dispersed is a very different

matter, and should only be done when the mischief is kept up by some local sanitary defect, which can only be remedied when the children are away. Thus, if an outbreak of typhoid fever occur, and it is certain that we know the cause and can remedy it, it will not be necessary to break up the school; but if, on the other hand, doubt exists as to its origin, or the sanitary defect cannot be immediately remedied, the school must be dismissed at once. If the pupils be sent home, it is most necessary to give the parents sufficient time to make the needful arrangements for isolating their other children, and also to inform them of the period of incubation of the illness; and, if possible, the clothes should be disinfected before the pupils leave the school.

Finally, allow me to sum up my suggestions under three heads:—

1. A good sanitary state of the school.

2. One medical officer solely responsible, and having full power to deal with infectious disease.

3. Certificates and quarantine, with thorough disinfection by the school authorities.

DISCUSSION.

Mr. EDWIN CHADWICK, C.B., said that so far back as the time of Lord Palmerston he had the honour to head a deputation of the medical officers of London to that statesman to call attention to the special provisions which should be taken in schools against epidemics, at that time the augmentation of deaths within the school ages being not less than 50,000 throughout the kingdom. They were promised attention, but that promise had not yet been performed, unless the Commission for providing against epidemics in cases of the dwellings of the wage class might be so considered. At the time to which he referred

he advised that the local Officer of Health should be charged with the function of visiting every school in the district at least once a week, and examining all the inmates. By so doing he would be able to see any symptoms of disease, and the schoolmaster or mistress would aid in pointing them out to him. Thereupon it would be his duty to remove the child, and not only so, but he or the sanitary inspector who would accompany him would take the child home and examine him, and at once make provision against the outbreak of the epidemic of the disease of which that child was suffering. Such a visit would, in a large proportion of cases, carry the inspector to a room occupied by the whole family, when he would at once direct that the child must be removed. Further than that it would be his duty to examine the house to see whether there were conditions for the perpetual propagation of disease, and give immediate orders for removal or alteraation. This would bring that particular tenement property within the provisions of the Common Lodging-house Act, by which over-crowding was prevented, and some rudimentary sanitary appliances were enforced, the result of which had been that a great benefit had been produced. The operation of that Act had converted former fever-nests into the most healthy places in the metropolis. In old times these common lodging-houses were the first places for the outbreak of epidemics, but now they were about the last, and were distinguished by their exemption. Until such a regulation of schools by qualified sanitary officers, and an executive assistant as sanitary inspector, were carried out, he feared there would be a continuance of these diseases, which in the metropolis killed 20,000 a year, and some 100,000 throughout the kingdom. There were schools in which children's diseases were almost unknown; the other day he visited one in company with Sir Charles Dilke, and asked the head master how long since he had any case of measles, and the reply was that it was about twelve years, although there were about 1000 children there; indeed, that the medical officers of this institution had expressed to

him their astonishment that these children's diseases were almost abolished. That was in the district half-time schools at Anerley, and he was told it was the same in several others. These were, in fact, children's hospitals; they often received children with disease upon them, but they were at once relegated to the fever ward, where they were duly examined; and the death-rate in these schools, although the children were of the lowest type in the metropolis, did not exceed three in a thousand, eliminating of course the cases of children who came in suffering from severe disease. The death-rate of children in common schools, on the other hand, was from six to eleven and twelve per thousand. He thought there was, perhaps, a little exaggeration with regard to the communication of infection by clothes, and he attributed much more importance to the thorough head-to-foot washing of the children, which not only prevented infectious disease, but reduced ordinary disease by fully one-third. He was quite satisfied that the best means by which medical men could protect themselves would be to wash twice or three times a day in cases of epidemics, and change their clothes. He should also like to see introduced a system which prevailed in Sweden, where every child on its introduction to a school was examined by the medical officer, and had a prescription written for it as to the gymnastic exercise it was to go through, which was found to act as a great protection against disease. The death-rate in Sweden was now only seventeen per thousand, the lowest of any country in Europe, which he attributed in a great degree to this system.

Mr. J. PRIDGIN TEALE, F.R.C.S., said it might not be known to every one that Dr. Alder Smith represented a new association, which was likely to be fraught with very good results in connection with the question under consideration, viz., an Association of Medical Officers of Schools, which had just been founded; so that there would now be an opportunity of gathering into a focus the experience of various medical officers, and of getting a general conclusion arrived at on many doubtful points on which one school acted in

one way, and another in another; and this would lead, he hoped, to the correction of some of the differences which had been spoken of. There were some public schools in which there was no medical officer, in which every house had its own medical man; and, of course, if infectious disease broke out you might have one medical officer taking one line, another taking another, and the Medical Officer of Health advising a third. What was the head master to do in the midst of such divided councils? Now that there was a central body to apply to he hoped such differences would disappear, and that all great schools would see the importance of having one person in each school responsible for the medical supervision, especially in reference to all infectious diseases. In some schools it was the custom to allow boys to go out for two days during each term, and in others to go out on Sundays for holidays, and though that could not be entirely stopped, at any rate in the large schools, and perhaps it was not so necessary with the older boys, yet he thought that in preparatory schools, and with younger children, this system was a very doubtful advantage. His boys were at a preparatory school, and he had notice that some illness with a rash had broken out, and was asked if he wished them to come home. He telegraphed for them to come at once, and within ten days one of them began with the measles. The day before they came home they were in chapel in the morning when two boys were taken out fainting, and were put into the sanatorium. His boys did not sit near them, or sleep in the same room, but yet they caught the measles, which came out in those boys the next day or the day after. Those two boys had been home for an *exeat* about ten days before, and when at home a sister was poorly, but without any rash, though after the boys came back the sister developed measles. Every boy on going to school should take with him a record of the illnesses he had had, and masters of schools should take more cognizance of sanitation and health questions than they had been in the habit of doing; but they could only do so with full effect

when they were properly guided by medical advice, and it would be a great assistance if every boy and girl took to school schedules filled up, stating what illnesses they had already gone through. Great care was taken in many schools, but in some none at all, to ascertain whether boys on coming back after the holidays were free from illness, or had been recently in contact with illness. On the previous day he had read a paper on "Over-pressure in Education," and he would suggest in reference to this subject that when boys were put into quarantine, thus losing two or three weeks of schooling, the medical officer should remember that they lost their position in the class, and that this was a very great hardship unless the masters would take it into account, and make them some allowance for the time they had lost. He hoped this question of making some allowance for boys, either in case of actual illness or when they were kept in quarantine for the sake of safety, would be more considered. As a rule, he did not think that either in Board Schools or in large schools there was sufficient watching of the condition of the boys. He should wish the master of every Board School, if he were intelligent enough, to cast his eyes over all the boys and girls, and that every child that did not look quite well should at once be put into a room, and have its temperature taken; and the same in public schools, when any outbreak of any disease occurred every boy who did not look quite well should immediately have his temperature taken. All schoolmasters ought to be instructed in these matters, which were now become the common property of the public. Then, again, since in large schools the sanatorium was sometimes an eighth or a quarter of a mile from the school, there should be some means of conveyance provided, for he had heard of more than one instance where boys actually suffering from measles had been made to get out of bed and to walk a considerable distance to the sanatorium, when, in fact, they were hardly able to do so. In one case the boy had to be watched almost day and night for six months, and another had his lungs

affected, from which he was still suffering, three or four years afterwards.

Dr. MARTIN quite agreed that much care should be taken with regard to schools at the time when contagious disease was about. A short time ago he was called in as Medical Officer of Health to enquire into an outbreak of measles, and he found there had been seven cases in one week; during the next week there were forty-five, and the next week forty-seven, when he closed the school. The disease was checked, and the parents took more care. During the present month he went to a house where a child was suffering from scarlet fever, and desquamation of the cuticle was going on, and yet the schoolmaster had sent for the child to go to school because the inspector was coming, for if the child were absent he would lose his grant. It would often happen, if parents kept their children from school, the schoolmaster was annoyed, and he thought therefore that some provision should be made by which the grant should be allowed for children who were kept at home on the certificate of a medical man in consequence of contagious disease. He had often been told when he had stopped children going to school that he was taking away the schoolmaster's living.

Dr. ROBERT PRINGLE said he had been so much gratified by the two Papers he had heard that as soon as they were published he should send copies out to India, where the question of infectious diseases was even more important than it was in this country. The age of the subjects of this discussion was just that most susceptible to the most serious complaints to which humanity was heir. He had only lately heard of a girl who was suffering now from a disease, the result of terrible neglect when at school, which had not yet been got rid of, and it was a question whether it ever would be. He concurred in all that had been said in the Papers, and on some points would even go further. He had no hesitation in saying, as the result of experience, that even where healthy exercise was carried to a great extent, but cleanliness and washing were not equally attended

to, there would be disease, because the skin got choked up. Disease came in through the skin, and so did health too, and if the pores were filled up through want of cleanliness, one great means of throwing off disease was obstructed. In cases of typhoid fever in London the drains were generally blamed, and justly so; but in foreign countries and country towns the fault would often be found to lie with the water, and he feared that very often the authorities in a school would be rather at a loss if they were asked to describe the state of the cisterns. If they were not kept clean, however, it was no use to go to the drains to look for disease. With regard to small-pox he was glad to say that it had a very small space in the Papers, for the best reason in the world, that he hoped they were going to get rid of it altogether. That time last year, when at Moossoonee as sanitary officer, he received a report that small-pox had broken out in the washermen's village, which of course was a very serious matter, and would be thought so even in England; but what must it be in a country where 95 per cent. of the population sometimes had small-pox. He at once went to the barracks and stopped all the clothes at the wash, and as they came in they were put into boiling-water and carefully subjected to a temperature of over 212 degrees. The result was there was no small-pox. In one large school in India, where vaccination was thoroughly carried out, there had been no case of small-pox in twenty years. He quite agreed that if illness in a school were due to some unascertained cause the school should not be closed, especially considering the strain there was now on education, and the difficulties there might be in receiving the children at home. A very useful thing in a large school no doubt was the disinfecting oven; but in all his service in India he had only known one oven, and that was in Jeypore, where the Rajah was a very wealthy man, and his medical officers were men who got the very latest of everything. This oven was used in an epidemic in that large city with the greatest benefit. Doctors should be especially careful that they did not carry infection, and they might even do so unwittingly; in fact,

on one occasion he himself was the culprit. He was called to diagnose between chicken-pox and small-pox, having been told that vaccination was ineffectual, as small-pox had appeared afterwards. This was amongst the natives, and when he went to examine he pointed out the difference between small-pox and chicken-pox, the former all appearing in one crop whilst chicken-pox appeared in successive ones. Although he did not enter a house, the inspection being in the open air, and he used the greatest care, still the disease broke out in his own family, and the only child who did not take it was one who had had chicken-pox in this country before going to India. Therefore it was especially necessary that every large school should have a medical officer of its own, so as to prevent the faintest possibility of his bringing in infection from the outside. A medical history sheet was also a most important thing in a large school. The subject of short-sightedness and defective vision had been referred to on the previous day, but he might be excused for again calling attention to it, and urging medical officers, if they noticed children trying to focus their eyes on the black-board, to carefully examine their eyes. These defects of vision seemed to be enormously on the increase, for when he was a boy certainly hardly any one wore spectacles.

Mr. JABEZ HOGG thought that no one would fancy that Dr. Alder Smith had exaggerated the importance of the subject he had been asked to deal with. From many years' study of zymotic diseases, and the best way of meeting them, he was convinced that the precautions which had been laid down were sensible and wise, and should be adopted everywhere. In his first investigation of these infectious diseases he was very much inclined to believe that they were due in great measure to the state of health of the patient; and all medical men admitted that there was a predisposition in some of these diseases which accounted for some children getting measles, whilst others, who ran the same risk, entirely escaped, and he was once of opinion that it was altogether due to some failure of the

general health, but further investigation of some cases of skin disease had satisfied him that these cases were really transmitted by contagion. His attention had been more directed to those diseases of the outer skin connected with the eye, a large number of which were brought to him from schools, and were particularly difficult to deal with, especially in London, where the children collected together in large numbers, so that it had become a matter of serious importance to know how to deal with these children. He was required to give a certificate stating that the child was not suffering from a contagious disease, but in many of these cases of catarrhal opthalmia one could never send the child back to school, because the disease was extremely contagious, and the children ought to be kept at home; but then the difficulty arose, especially amongst poor people, how were they to do so? Many of them lived in one or two rooms, and what was the poor mother to do with a sick child who required separation from five or six others. The time had now arrived when some effort should be made on the part of the authorities to set up convalescent homes for the reception of such children, in order that they should not be sent home to mix with the rest of the family. In that way a vast amount of zymotic and contagious diseases would be checked, and their progress stopped. His opinion was very strongly against large palatial buildings, where the patients were brought together in hundreds. In 1868, when there was an epidemic of cholera, Dr. Buchanan devised a plan for the opening of small local hospitals, and that was done in his district with great success, so that all cases that arose were dealt with without great difficulty. There were generally places in London which could be utilised for this purpose. In the case of the St. Giles's district it was a disused school, which was fitted up with beds and necessary arrangements. The same thing might be done with other forms of disease. The great objection he found to the removal of children of the poor was that the children were taken away from them to these large hospitals; and

it would be remembered that even in the outbreak of only a few years back the patients were received with such want of care that some of the poor children were lost, and died without the parents even seeing them or being able to recognise them afterwards, and in some cases they were even buried under a wrong name. Again, it was very objectionable to have to remove sick people to a long distance. There was not only the danger of contagion, but sometimes the patient might sink under the fatigue of a long journey. All the large schools in London had medical officers, the only exception that he knew of being those where they were all day scholars. He had no doubt the society which had now been established by Dr. Alder Smith would be attended with considerable advantage, as it would bring the medical officers of schools into communication, and would no doubt be of value in lessening the danger of contagion.

Mr. ARMSTRONG, of Wellington School, had listened with great interest to Dr. Alder Smith's paper, and thought some of the lines he had laid down would lead to an immense deal of work being thrown upon the medical officer, which would entail a large mass of correspondence, and would probably bring them into anything but good odour with some of the parents. It frequently happened that when the rule with regard to quarantine was stated, the reply was that such and such a rule was not in force at other schools, and therefore it was very important that they should have some common standpoint on which to go. Dr. Smith said it was desirable that every school should have a sanatorium in which all cases of infectious diseases should be placed; he went further than that, and said that all disease should be placed in the sanatorium. Their rule was that nobody was allowed to stop out of school for more than one day without seeing the medical officer. They had no such abominations as sick rooms in the house, and it was impossible for the boys to lay up without seeing the medical officer. It prevented the boys shamming, and prevented them hanging on until the outbreak of an eruption

compelled them to appear before the medical officer. He should also extend the rule further with regard to a town being considered out of bounds if infection were known to exist there; Mr. Dyke had used a very good simile of a baker's boy and a sweep—the baker being the boy from the school who ran a great chance of running against the sweep, in an infectious state, walking about the streets, and he certainly had known instances in which disease had been spread in this way. Only a few weeks ago one of their boys had to come up to Woolwich for an examination, and he brought back measles. This also illustrated the possibility of stamping out measles, for that was the only case that occurred. Dr. Smith said it was desirable, but not necessary, to have a separate hospital for scarlet fever, and to a large extent he went with him. It was necessary really to have the scarlet-fever block attached to the general sanatorium, because it was desirable there should be some head of the sanatorium who would take the place of the teacher or boarding-house master, for boys were boys, and would get up to all sorts of games if left to themselves; but it was absolutely necessary that such a ward should have an egress other than the general egress of the sanatorium, so that the boys when convalescing should be able to get exercise without going through the main block. Another question of extreme importance was that of allowing the masters to visit the boys when suffering from infectious disease, and this was a point which required to be looked at from other points of view besides that of the doctor. The master, who was generally a clergyman, had his point of view; and though he should have said, when the question was first proposed to him, Certainly not; he must say that on further consideration he was inclined to take a somewhat medium course. The master would say, Is the boy to die without any ministrations? and his answer was, No; when the boy was sufficiently bad, or I think he is going to die, I will let you know. Then the master replied, Was it desirable, if he thought the boy was going to die, that he should have it brought before him as plainly as it would

be by the master going to see him if that were only allowed in such cases? It was therefore a very large question, and on due consideration he was of opinion that the master should be allowed to visit the sick boys, of course taking the same precautions as the doctor would; if many cases of sickness occurred he would not allow more than one master to visit them. With regard to letters, he did not think parents would agree to a cessation of letters from their children, but the plan he adopted was to appoint a certain day for letters to be sent, and they were all carefully disinfected. He understood that Dr. Dyke was of opinion that exanthematous diseases were infectious during the sickening, but if so, he believed it to be impossible to stamp out infectious diseases, and the whole gist of Dr. Alder Smith's paper would be taken away. The great point which they all considered so important was the isolation of cases of disease, but they did not know what the disease was until it broke out, and if it were infectious during the sickening period how would it be possible to isolate them? He also thought most of the evidence was against it. They had definite authorities to the effect that the incubation of scarlet fever took from five to seven days; if they had one case they generally expected to find another case in five days, and again in five days later, but if it were infectious during the period of sickening, the cases ought to follow one another from day to day.

Dr. FRANKLIN TAYLOR (Medical Officer to the High School, Philadelphia) said he had crossed the ocean, amongst other things, to attend this Conference, and the one to be held next week. In many things, of course, America acknowledged England's superiority in matters of education and health, though on some points with regard to education they might claim an equal standing. He had been pleased to hear Dr. Pringle say that these papers would go to India, and he certainly wanted them to do good in the United States. He was inclined to think the question of having good schools in India and good sanitary arrangements in the Western world was quite as important

as the Egyptian question, and the particular point which struck him was the importance of having the medical supervision of the large shools under one head. In the Philadelphia High School, which contained about 600 students selected from the most advanced scholars of the city schools, there was no medical inspector for the school; it was true the Board of Health, with its medical officer, had charge of that question, as well as of others appertaining to the health of the City, but they had so many other duties to attend to, that unless there were some serious outbreak of disease they did not attend to it at all. What he should recommend, therefore, in America was, that a suitable medical officer, as important as any professor in the school, should be appointed whose duty it should be to take charge of the health of the school. He understood, however, that some of the great schools in England were in the same condition; but if that applied to any such school as Eton he certainly thought it was quite as important a question to attend to as that of appointing a head master.

Dr. SHELLEY (Haileybury) said, although there might be some points on which they had not all made up their minds, yet there were others on which those who had the widest experience were certainly at one, and these ought to be made public, and brought to the attention of all who had charge of children, because they were really as much interested in the matter as the medical officers of the schools to which they were consigned. With regard to others on which they were still perhaps somewhat divided, such meetings, and the discussions to which they gave rise, were some of the best means by which they might hope sooner or later to attain to greater unanimity. He thought it very desirable in all large schools that there should be not only a sanatorium for infectious cases, but a sick house, as they called it at Haileybury, where all cases of apparently simple illness and accident were first sent. There was a separate building, under the supervision of a matron, where sixty or seventy beds were

always ready. If a boy were found to be suffering from some vague sort of illness, which could not be exactly diagnosed, he was put into one of the upper rooms—if it turned out to be nothing particular, no harm was done, but if it turned out to be something special, he could be shipped off at once to the sanatorium, which stood by itself, isolated from the rest of the buildings, with a separate staff, and the room he had temporarily occupied could be at once disinfected. This was much better than simply putting a boy under the care of a matron in his own master's house, and not coming to the medical officer until his schoolfellows, or some one discovered that he had a rash, or was beginning to walk in his sleep or misbehave in some similar fashion. Another great question in which all those who had to do with schools from a medical point of view were at one, was, that there should be undivided responsibility with regard to their medical treatment. If there were divided responsibility it was sure to be frittered away amongst a number of people, and the end of it was that it slipped through their fingers altogether, and some serious irremediable mischief was done without its being exactly known who was to blame. With regard to the certificate which Dr. Smith said should be required from parents and guardians when boys came to school, he quite agreed that they should be given, for although experienced medical men did not always attach very great importance to them, they had this value, that they called the attention of the parent or guardian to the fact that there was such a thing as a danger of propagating disease, and that he was held responsible for guarding against it as far as possible. At Haileybury they were very particular about these certificates, going so far as to make it a regulation that if the parent or guardian did not sign this certificate to the best of his knowledge and ability and in a conscientious manner, such an omission was considered as a breach of contract, and the boy practically became liable to expulsion. Any one who put himself in the place of a parent who had

a child there who might contract disease and die, would not think that was by any means too harsh a regulation. Dr. Smith, in fixing the period to be allowed for scarlet fever, allowed so many days after the cessation of desquamation, but he should be tempted to add a word in regard to the state of the throat. This point had been brought out lately by Dr. Bond, who showed that you might have in some cases a desquamation which was very slight, and might even appear to be completed, but people would sometimes peel three times over after cases of scarlet fever, and it was not always safe because one peeling was over; and in any such doubtful cases it was of great importance to pay attention to the state of the throat. It was a most desirable thing, if not always practicable, to have an undivided medical authority in a school, and medical officers of a school might claim in some degree to stand between the public and the authorities. That was not always an enviable position, for according to his experience, which had now extended over some years, you were apt sometimes to be called an alarmist, or else an enthusiast, which was only another way of saying that you had a bee in your bonnet. But it must be remembered that in all this work medical men were in some sort cutting their own throats; as a great medical authority once said to him, every case they successfully vaccinated was a possible loss of a small-pox patient, and their efforts against bad drainage in the loss perhaps of two or three typhoid fever or diphtheria cases, whereby they lost a considerable amount of money. But that was not the point of view in which medical men looked at it. They were at least disinterested in the duty they believed they were fulfilling, but in all such instances the duty was not on one side only. If they had lived in a city where the death-rate stood week after week at 60 or 70 per 1000, and in one week at over 90 per 1000, and knew that amongst the native population there was such an entire absence of anything like sanitary knowledge that more than one in ten die of a disease such as measles—something so simple that in

England people were glad to have all their children get it over at once, and poor people would often send their children into a neighbour's cottage to catch it and have done with it—they would understand the feeling of medical man, that they could not refrain from preaching the necessity of sanitation; and in large schools, where there were numbers of young people of a susceptible age brought together, they would be failing in their duty if they did not use every effort to close the door against all inroads of infectious disease. But still it was not the duty of the medical man only, it was the duty of the public to aid his preaching, and to draw attention to it; and he should much like to see not only the adult public, but the younger public, more fully instructed in those matters. It had been said that a man who reached the age of forty without having changed his opinion on some important subject, was a fool, and it had also been said that it was a very hopeless matter to attempt to change the opinions on any important subject of any person who was forty or over forty. On all grounds, therefore, they ought not to neglect to educate the rising generation; and he should like to see a thorough instruction given in all schools in the elements of hygiene, not as an addition to the present curriculum, but to take the place of some of the present subjects, which were no doubt useful as mental exercises, but which could not be said to have such a practical value in future. Young people should be taught not to have a selfish solicitude for the convenience of their body, but to honour their body—that it was to their interest to take an honest care of it, and he was sometimes tempted to think that the parents and guardians who pay a great deal of attention and spend a great deal of time and trouble in learning something about the bodies of their prize oxen or sheep, or horses or dogs, or even poultry, were apt to regard the bodies of their children as if they were built of boiler iron, and endowed with perpetual motion.

Mr. JABEZ HOGG asked whether in Christ's Hospital it

was still the practice for the boys to wait on those who were sick, or if that had been abolished?

Mr. TOMKINS (Tunbridge), as one of a class very much interested in this question, namely, the parents, begged to express his thanks to the authors of the Papers. It was very important that boys sent to school should not carry infection with them, and, on the other hand, it was also important that the boys should not carry infection home with them. In many cases it would be very difficult to have those materials and appliances for disinfecting clothes and books which would be readily enough employed in large schools, and therefore he thanked Mr. Hogg for his suggestion that before boys were sent home after an infectious disease they should be kept in quarantine, or sent away to some convalescent institution. If the masters would be good enough to devise some plan by which boys could be sent to such an institution at times when they required change, or were not fit to associate with the rest of the family, they would be conferring a great benefit. The Home Hospitals Association, for paying patients, had taken up this subject; they had been very successful in their hospital management at Fitzroy House, and were now anxious to establish convalescent homes, where people who could afford to pay would be able to send their children to be thoroughly disinfected and cured before returning home, and he was sure the Hon. Sec. of that institution would be glad to send particulars to any one interested in the question.

Dr. LEVER said the great object of the meeting was the prevention of disease, and he thought parents were very often responsible for this. If parents had children who had been suffering from measles, scarlet fever, or any such disease, they should not allow their children to return to school without medical advice. He could mention an instance in which two boys had been sent to different schools, and both were infected with measles, when, with a little care, the whole of this might have been avoided. It

was a somewhat vexed question, on which he was often consulted, as to when a child should return to school, but he never allowed a child to go to a school from a house where measles had actually occurred until he had been away from all contagious disease for fourteen or sixteen days at least. There was sometimes a difficulty in determining whether a child was suffering from measles or German measles, with which disease a person might be attacked three or four times, whereas it was very uncommon to have genuine measles more than once, and this sometimes led to difficulty with regard to disinfection. Dr. Smith said he always had the clothes disinfected at school before the boys went home; but with regard to their coming back he did not see why parents should not send them back in clothes they had never worn before, which would avoid all danger. It was one of the most important things in public elementary schools to do as Mr. Dyke said, and close the school whenever scarlet fever or measles broke out. How did measles enter a school? The boy either brought it from the place where he started, or else caught it in travelling, for he knew an instance in which a boy came from abroad, and fourteen days after the date he started he was affected with measles, which went through the whole school. He would also refer to a case in which scarlet fever broke out next door to a large school, the disease being very virulent. He was consulted, and recommended the school authorities to apply to the health officer. He recommended that the woman should be removed, and the school authorities would have been willing to pay the expense of this, and to take another house in which to put the children, but the husband would not consent to his wife's removal. The medical officer of health then inspected the house, and reported that its sanitary condition was so bad that it was necessary that the woman should be removed to an infirmary, and obtained an order from the magistrate for that purpose, but still the man refused to allow his wife to go. A proper nurse was then put into the house to look after the woman, and the

case went on, but the school authorities were so annoyed that they prosecuted the man for not obeying the order of the magistrates, but they were not successful, the magistrates being of opinion that it was not necessary to remove the woman. That would be a difficulty which would occur in the case of children; where was a child with fever to be removed to? He knew a case where measles went right through a school, but if it had been shut up directly the first case appeared the epidemic would have been stopped.

Miss WILLIAMSON asked if it were a fact that measles and German measles were infectious during the incubation period? Last summer she had an epidemic of so-called German measles, which was distinctly traceable to the incubating period.

The CHAIRMAN said he thought the Conference might be congratulated on the interesting discussion which had taken place, and still more on the promise which was held out of permanent discussion of the same kind, which would lead to the solution of some of the questions which were at present rather difficult of solution. He might congratulate the authors of the Papers on the very large measure of success which had attended their respective efforts in controlling infectious disease introduced into schools. Differently circumstanced as they were, they had each been able to effect a rapid extinction of the more common epidemics. He had himself so urgently felt the importance of controlling by skilled knowledge the extension of disease through communities by means of public elementary schools, that he had urged on the Education Department, with success, the need for a rule absolute to prevent the spread of infection in that way, and it was now provided that the managers must, as a condition of receiving the Parliamentary grant, comply with any notice of the sanitary authority of the district in which the school was situated, requiring them for a specified time either to exclude particular scholars from attendance, or close the school, subject, of course, to an appeal to the Department. A single respon-

sible medical head ought to advise in such a matter as to whether a particular scholar should be received into a public elementary school, and also on a question as to whether such a school should continue open, and a great deal of the responsibility was put upon the medical officer who had this duty. It would compel him to be very careful in the interests of health in his district on the one hand, whilst there would be a corresponding serious responsibility on him not to interfere unnecessarily with the educational operations of the school. Mr. Dyke had pointed out some of the advantages arising from closing schools in the case of scarlatina, and no doubt many others present could have given similar examples. The discussion, however, had rather drifted to the equally interesting side of it put forward by Dr. Alder Smith, whom he would ask presently to reply to the various questions which had been asked. They wanted very much to know what was a practical way of preventing outbreaks of disease spreading from apparently healthy persons—persons who were incubating measles, but who had not yet got the eruption but who were capable of affecting people around them, while showing no symptoms beyond sneezing, or a little running at the nose.

Mr. DYKE said, in reply to the inquiry made by Miss Williamson, he might say that the result of his experience of over fifty years was, that diseases of the febrile kind were all of them infectious in the invasion stage. He knew that many of his medical friends, especially in London, did not hold that view, but such was his experience.

With regard to the attendance at schools, he was informed that in the last Circular issued by the Education Department it was stated that the attendances at school were only to count during the last twenty-two weeks preceding the period of examination. It did not matter how many days a child might lose before those twenty-two weeks, there was no need to press him to go to school but in the last twenty-two weeks. There was certainly a strong motive to compel his attendance, even if he were ill, and

he did not think the Education Department could have consulted the medical officers before issuing that regulation. He had been informed that this was so by a schoolmaster.

The CHAIRMAN said he thought the schoolmaster must be misinformed.

Mr. DYKE said the only other point was this: he did not know who were to look after the school managers, who were masters of the situation. Last January two years he applied to the Local Government Board, having been refused an order to close a school, and a reply was sent down urging that the school should be closed, but the Board declined to take any notice of it. It is a question of *quis custodiat custodes.* He thought the whole control in such matters should be placed in the hands of the inspectors of schools, who could investigate the matter, and, if necessary, order a school to be closed at once. If that could be brought to pass, and the whole burden of the local district work thrown on the shoulders of the Government officer of the district, the inspector of schools, the great difficulty they now had in getting Board Schools properly looked after would be removed.

Dr. ALDER SMITH said, in reply to the first question which had been asked, viz., the loss of time when boys were in quarantine, he could only say that the general health of the school must be considered before the interests of an individual boy, and it was better for one or two boys to lose two or three weeks than have any risk of an outbreak of fever. Mr. Armstrong had asked about common standards for quarantine, and fixing certain rules, in reply to which he would say that the Association of Medical Officers of Schools would take up that point very soon. It was one of the first things suggested that they should draw out a series of regulations respecting such matters.

With regard to sending all cases to a sanatorium, his paper simply dealt with the preventive treatment of infectious diseases, but he had said that boys when ill should at once go into a sanatorium; no boy ought to be left in the wards or dormitories if he were ill. As to the question

whether masters should visit the boys who were ill with fever, he certainly should not unless there was imminent danger, and then he agreed that a master ought to be allowed to go in and see the boy, using the same precautions as the doctor. He had never lost a case of scarlet fever, and so had never had to admit a master into the infectious wards. Mr. Jabez Hogg had asked whether the boys waited on the sick. It was quite a new idea to him, for he had never heard of it, and it had certainly never been done during the last sixteen years. They had a matron, a day nurse, a night nurse, a fever nurse, and a staff of four servants as well, and the boys were never allowed to wait on one another.

Mr. Tomkins had made a remark about boys taking infection home with them. He had only dealt with the question of preventing disease coming into a school, not going out of it; but he had pointed out that if there were an outbreak in the school the boys' clothes ought to be disinfected, and no boy ought to be allowed to leave the sanatorium until he was free from infection. If the school authorities would consider the parents, the parents would be likely to think more of the school. He certainly never sent boys home until they were free from infection. No amount of quarantine would disinfect clothes; it must be done thoroughly.

With regard to the question when German measles, and measles especially, were infectious, he should say it was certainly so directly you got any cough, or sneezing, or any catarrhal symptoms. He did not think you could say when it was infectious, but it certainly was three, four, or five days before the rash came out; and if you had a large number of young boys, as at Hertford, where there were 400, ranging from seven to eleven, many of whom had not had measles when they entered. If you once got measles there it was very difficult to prevent it spreading. On the other hand, in London, most of the boys had been through an outbreak of measles at Hertford, and therefore he hardly ever got measles in London, but of German measles he

sometimes had sixty or eighty cases together. It was very infectious, but how many days it was before it came out he could not say, but any one ought to be isolated directly there were any catarrhal symptoms.

Mr. JABEZ HOGG having proposed a vote of thanks to the CHAIRMAN, which was seconded by Dr. PRINGLE, and carried unanimously, the Conference adjourned.

CONFERENCE ON THURSDAY, JULY 31, 1884.

SCHOOL CONSTRUCTION.

SUBJECTS FOR DISCUSSION:—

9. "*School Dormitories.*" By CLEMENT DUKES, M.D., B.S., M.R.C.P. LOND.
10. "*Postures in Schools: their Influence upon Physical Development.*" By NOBLE SMITH, F.R.C.S. ED.
11. "*On the Arrangement and Construction of Large Middle Class Schools—Grammar and High Schools.*" By J. MURGATROYD, F.R.I.B.A., MANCHESTER.

The chair was taken by Dr. LANGDON DOWN, in the absence of Sir Rutherford Alcock.

SCHOOL DORMITORIES.

By CLEMENT DUKES, M.D., B.S., M.R.C.P., LOND.
Physician to Rugby School, and to the Hospital of St. Cross, Rugby.

MR. CHAIRMAN, LADIES and GENTLEMEN: In this Table I have shown the heads into which I have divided my Paper. Much that I had intended to speak of I have had to withdraw so as not to trespass over the allotted time.

I have chosen the subject of "School Dormitories," because they are about the worst feature in all our boarding schools—for boys and girls—in Great Britain. Not that I wish to imply that they are all uniformly bad: far from it. Some, I am thankful to say, are everything that could be desired by the most exacting sanitarian; but this number, I believe, would be found not to reach 10 per cent.

of the whole: while, of the remainder, 50 per cent. would be found to be as bad as they could possibly be, and 40 per cent. just passable, but nothing like what they should be.

It is an incontrovertible fact, that in many of our schools, of which we Englishmen are so justly proud, the dormitory accommodation is actually worse than that insisted on by Government for the paupers in our workhouses—there being less than 300 cubic feet per head.

And in those schools where the boys live and sleep in *cubicles*, it is quite refreshing to find 700 cubic feet provided —which is the lowest limit allowed for our paupers, who occupy the same room day and night, in our workhouses.

But what is the most unsatisfactory fact is, the expensive school— where a parent thinks his child is sure to be placed in the most favourable hygienic conditions because he pays so much—is often the worst of all. When pupils go home for the vacation looking unwell, the school is frequently abused, either because "the boy or girl has been worked too hard," or else it is said that "the food has been insufficient in quantity or inferior in quality."

Now nine times out of ten this is not the cause at all: the whole secret is, the pupil has not been allowed sufficient fresh air *indoors*, and so has had to breathe the same air more than once.

Air is the greatest essential to life—greater far than water or food. We cannot exist a few moments even without it; and yet schools, as a rule, provide plenty of food, are less particular about the quality of the water, and have very little regard as to the amount—and therefore as to the quality—of the air.

Not that the boy does not get out of doors enough, for this out-of-door life in most schools for boys—would that I could say the same for girls—is ample; but because of the insufficient air space indoors, especially in the sleeping apartments, where a third of every day is spent. This means, that in a term of three months, one month is passed in the dormitory, where the air space is, as a rule,

so deficient that it literally stinks in the morning after eight hours' occupation.

Fortunately, so much time is spent in the fresh air, that the evil, to a great extent, is counteracted; yet, I would urge, that no growing boys or girls can thrive as they should and would, while they spend a third of their time under these most unfavourable conditions. To some boys, it apparently does not make much difference; but to many a delicate boy, it makes all the difference in the world, whether he shall grow up strong and hearty, or show some latent disease that need not otherwise have developed, —nay, could not have developed during a favourable school-life. Parents should understand that hard work rarely makes a boy look ill, provided he is well-fed, properly housed, and with regular exercise. I have, however, known disease and death to be caused by compelling boys to work hard under the most unfavourable conditions that it is possible to conceive.

Dormitories are provided for the exercise of that most important function called *sleep*, a plentiful supply of which I regard as essential as a plentiful supply of food for the young and growing. Yet, there is a tendency in all our schools to cut sleep too short. All scholars suffer from it more or less; but it is not sufficiently recognised by teachers: in fact, the only persons who fail to recognise the fact at all are those who should see it first,—the masters and mistresses themselves.

Parents are cognizant of the fact only too well, during the first few days of the vacation; and are apt to think their children will sleep away their senses, or that they are becoming regular sluggards: the fact being, that they are only making up for lost time.

Those who suffer most from deficient sleep are the *younger* boys and girls; and were it not for the vacation stepping in every three months, I do not believe they could go on with their work and yet retain their health.

Those also who suffer considerably are girls during their early development into womanhood, when they are growing

rapidly, thickening out in all proportions, and establishing new functions: they need then a very large amount of bodily and mental rest and sleep if they are to grow strong bodies and make good brains.

Cubicles.—The cubicle is a small room, with four walls, which serves as study and bedroom combined. Each boy has one to himself usually; sometimes brothers have a larger one between them.

They measure, as a rule, about $8 \times 8 \times 10 = 640$ cubic feet; I have seen them larger, and I have seen them smaller. I have also seen them so dark as to resemble a prisoner's cell far more than the abode of a boy night and day during eight months in the year, whose parent pays heavily for the privilege of his being confined in it. Here, with insufficient air-space, breathing the same air day and night, with insufficient light and ventilation, and with every facility for secret vice, the boy is expected to thrive mentally, morally, and physically; and is often abused by his parent—who pays from £100 to £250, for eight months in the year—because he does not get on well with his work, or does not seem healthy and strong, or because he does not turn out well morally.

2. *Cubicles in large dormitories.*—In this plan we have a very large room, partitioned off into small rooms, or cubicles, on either side of a passage down the centre of the room, into which the door of every cubicle opens.

The room itself, about 12 feet high, contains from 20 to 40 cubicles, each being about 8 to 9 feet square, and separated from the adjoining one by a wooden partition about 8 feet high, and from the one on the opposite side by the passage.

Above these partitions, between them and the ceiling, is a height of 4 feet, which space is common to all the cubicles in the room.

There is therefore a good supply of air for the day *or* the night, but a most insufficient supply for work by day, candles or gas by night, and then sleep; for, being occupied, it is always impossible to get windows open

sufficiently so as to render them as sweet and wholesome as they should be, artificial ventilation not being enough, unless the air be warmed.

Let us look at the winter for instance, when school and tea are over, boys will be in these cubicles by 6·30 p.m.; and there they will remain—(with candles, lamps, or gas, burning until 10 p.m.)—until 6·30 a.m.; the air being very scantily changed throughout the 12 hours.

Is this healthy? Is this placing the young under the most favourable circumstances we can during their growing years? It is really indefensible.

Moreover, the evil of cubicles is great, from a moral point of view. The upholders of them, whose name is legion, deny that they are bad, and that boys keep to their own cubicles by night. I know better! and probably those who ought to know this best of all, are the only persons who know nothing about it. Why, I know one of our largest, and justly most popular schools—which would probably deny the existence of the evil altogether—where they put up perhaps a large heavy board on the top of the partition between each cubicle, about 8 × 3 feet, which they fastened up by wire, so that any boy who attempted to get from one cubicle to another would break the wire, and pull the board down, and thus be detected. Any boy of mettle, from his delight of mischief alone, could and would easily overcome this little difficulty, in the shape of a trap set for him by some authority who does not know boys.

Dormitories.—Very strongly indeed do I hold that dormitories should be places to sleep in only, and should be always closed to all boys by day. It is better for the rooms themselves, for cleanliness and ventilation; and far better for the boys. They should be large rooms, and open to the view of every occupant of the dormitory: from ten to sixteen beds in each is a good size.

Size of Place for Sleeping.—Parkes showed that every adult requires about 800 cubic feet of space for breathing in, and that with efficient ventilation besides, so as to

render the air sufficiently pure to carry on respiration without draught.

He showed that air containing more carbonic acid than ·6 per 1,000 volumes is poisonous; though it is the foul organic matter, and the excess of moisture, that is most perceptible to the senses, and renders the rooms what is called "stuffy."

To prevent this occurring, 3,000 cubic feet of fresh air are required to be replenished every hour. If this air be changed by ventilation more frequently than three or four times an hour such a draught is occasioned, as no one can comfortably bear night *or* day, in our climate.

Therefore, 800 cubic feet of space should be supplied for each boy.

Huxley says, a healthy man of eleven stone, ought to have at least 800 cubic feet of well-ventilated space.

John Howard, the far-seeing philanthropist, said a century ago, "It may be asked of what size I would wish prisoners' solitary night rooms to be? I answer 10 feet long, 10 feet high, and 8 feet wide." i.e., 800 cubic feet. If such be requisite—as it undoubtedly is—for prisoners, how much more is it for growing girls and boys? Are our sons and daughters, whose education is so costly, to be worse housed than our prisoners and paupers?

But masters and mistresses will say, "I don't see the necessity of this large air space for sleeping in, when I have provided efficient ventilation."

The answer to which is, if you have such a small cubic space per head that, to get efficient ventilation, the air has to enter with a rush, no boy or girl will put up with it: consequently one sees all the ventilators stopped by the pupils with various articles of clothing, from a sock to a dressing-gown, according to the size of the ventilator.

Of course in warm weather air may enter very rapidly without perceptible draught, and so less cubic space may suffice then. Or, if the incoming air be artificially warmed, it can be admitted much more freely without draught being felt, and then again a smaller cubic space will yet be

sufficient; but, as a rule, in our climate 800 cubic feet of space per head is what ought to be provided in all school dormitories. Be it ever remembered that those who are growing cannot thrive without the purest air; they are peculiarly sensitive—together with the young of all animals—to impure or pre-breathed air.

Many will urge that if 800 cubic feet of space be required by day, half that amount is enough for bedrooms, because respiration is slower, and all the tissue changes are less active. Let those who hold this comfortable theory taste a little practical experience, and enter a dormitory immediately after it has been vacated, after eight hours' occupation, with 400 cubic feet per head alone supplied: their noses will tell them the truth, and make them retire quicker than they entered, and show them the futility of their theory.

Superficial area.—It is a point of great importance in the dormitories of schools, that sufficient superficial area should be provided for each scholar, and that beds should not be placed side by side so close together that you can only just get between them—and that for more reasons than one. I have seen them so nearly touching each other that they were almost one bed; and thus necessarily entailing nearly all the evils of boys sleeping together, which should never be allowed. Another disadvantage of this close packing is, that if an infectious illness attack a pupil in one bed, the occupants of the adjoining beds are almost sure to be infected too. Therefore superficial area is of great consequence; and taking a school-bed at 3×6 feet, the superficial area should be quite four times that, 6×12 feet, and the room 12 feet high. This gives 864 cubic feet per head, which will allow for the air which is displaced by the furniture of the room, and the body of the boy, and yet give the full complement of 800 cubic feet per head. A friend of mine has increased the distance between the breath of each boy, so as to minimise infection, by placing the beds with heads and feet alternately to the wall.

By these means plenty of air will be allowed to every scholar, which is no little matter. In a large school there are pupils of every type of constitution, and every degree of stamina, representing every constitution under the sun. Among them many from a tubercular stock. Who will venture to gainsay the vast difference it makes to that unfortunate boy or girl, during his years of development, whether he have plenty of fresh and pure air, or whether he be compelled to breathe the same air over again? It may make this difference to him, whether he become a tubercular or non-tubercular individual: whether he die early, or live to maturity.

Construction of Dormitories.—One word only on this subject: 1. The *walls* should be what are termed "Hollow Walls," they are warmer in winter, and cooler in summer; and if ventilating bricks be placed in the outside wall below, and in the inside wall near the upper part of the dormitory, there will be a continual current of fresh air entering the dormitory, indirectly, and therefore without a rush.

They should be either lined on the inside with varnished match-boarding: or plastered, and the surface of the plaster coloured with "silicate," or else with paint: both of which should be washed annually.

2. The *floor*, should be laid so as to obtain a level and smooth surface, with an absence of cracks and bad joints: all the joints should be tongued: the skirting boards should be let into a groove in the boards of the floor, so as to prevent an accumulation of dirt. The whole should be stained and varnished, so that it may be bees'-waxed from time to time in lieu of washing.

Parquet flooring is excellent; but carpets should on no account be used.

3. The ceiling may be of plaster, whitewashed; or, better still, of match boards stained and varnished, which can be annually washed.

Sanitary Conditions of Dormitories.—In speaking of these our first consideration must be that of—

1. *Aspect.*—For the young and growing, the sun is always most invaluable, even in dormitories which may be unoccupied during the time the sun is on them.

The southern aspect is the best of all. A dormitory which faces thus, is far more healthy than one devoid of sun; for it is warmer and drier; the air is purer; the organic matter given off from the inmates is burnt up more completely; and mildew is unable to exist there.

2. *Light.*—*Natural* light is obtained by means of windows, which should be ample, at least $\frac{1}{10}$ of the floor area. They should reach the ceiling above, so that when open at the top they may clear the upper stratum of air; but should not reach too low down, but be well clear of the heads of the beds, and thus not occasion draught there. They should be well opened by day and in winter closed before sunset. Where possible, they should be placed on opposite sides of dormitories.

Artificial light should be obtained by the "Sun-light ventilators": or Benham's ventilating globe light; and if left burning slightly all night, the rooms would be more healthy from a better ventilation, and from a moral point of view.

Ventilation.—I have already said a great deal concerning the importance of fresh air, and plenty of it, for dormitories. Time will not permit me to say more than a word or two concerning the modes by which this may be carried out. Fresh air may be obtained by means of the open chimney, by ventilators placed over doors into passages, which in their turn should be well ventilated; by Ellison's conical-brick-ventilators; by Tobin's system; by Bird's method with the window sashes; by Boyle's air-pump ventilator; and by Sherringham's and Arnott's valves.

Warmth for school dormitories, I regard as an unnecessary luxury; but, where desired, it can be provided by the open fire or by hot-water pipes.

Warmth and Ventilation combined is the only form which should be used, if warmth be desired at all, a point which I should not myself advocate, unless the school be

placed in a cold and damp situation,—in which case it had better not exist at all, as such a site is most unsuitable for the education of the young.

It can be carried out by hot-air flues ; by Galton's grate ; the Calorigen ; and the Euthermic.

It should never be effected, as is so constantly the case at present, by freely lighting the gas for an hour or two before bed time. This is bad in the extreme : better have no warming than such warming, which burns up all the fresh air, and poisons the rest with deleterious gases. It may, however, be well and legitimately used to assist in warming and airing the dormitories during the last few days of the vacation, before the scholars return to school, provided the windows be left open for an inch at the top.

Washing Arrangements.—These should be well arranged so as to allow of the use of plenty of water for washing purposes, with as little trouble as possible. I have had fixed in a new boarding-house, Jennings' tip-up basins ; the pipes from them open below into the air-chamber of an Edinburgh trap. Each basin is supplied with a tap, by which means there is always an abundance of water.

Slop-receiver.—Dormitories are sometimes converted into poisonous chambers through an improper water-closet in the neighbourhood ; through an untrapped housemaid's sink ; through a bath-waste or through a cistern over-flow pipe, being simply ventilators to the sewer. Now this is a criminal fault.

The housemaid's sink, or slop receiver, should be placed as handy as possible for the convenience of servants. It should be of glazed earthenware, or still better of glass ; and the pipe from it should be syphoned immediately beneath the sink, so as to prevent the entrance of air by it. Below, it should terminate—together with the bath-waste, the cistern overflow, and the rain water stack pipe—either in the air-chamber of such a trap as the Edinburgh, or else over the iron grating of an open gully trap.

The night water-closet should be conveniently situated, and should be well-ventilated into the open air at the floor

and ceiling lines; no slops should be emptied down it. The soil pipe from it should not communicate directly with the sewer but only through such a trap as the Edinburgh air-chambered sewer trap, to be especially recommended to schools, not only on account of its efficiency, but because it is the invention of a school-master, one of the greatest sanitarians of the day and a most intimate friend of mine.

Baths.—Close to the dormitories there should be a sufficient number of baths for every boy to have his daily morning bath; it is not only a luxury, but a necessity for health and cleanliness in the young and growing. I know the answer will be, "The thing is impossible in a large school." This is not so, for it is already an accomplished fact.

Beds. — Size. — The beds in most schools are about 3×6 ft. in size, and as I have stated before, there should be allotted to every boy four times this size of floor space, so that there will be over three feet between each bed, side by side, and twelve feet between the beds on the opposite sides of the room.

Or, if the partitions be used, the floor space between each bed is very much increased by placing the bed against one of the partitions, and if these be not too large, good is gained by the plan, for they do not serve as screens; though on the whole, all things being considered, I think dormitories without them are better.

Bedding. — It is always best in schools, whether for boys or girls, that mattresses should be used for sleeping on, a horse-hair mattress being the best and cheapest in the long run.

Sheets.—The most appropriate sheets for those who are growing are cotton: they are preferable to linen, as they are warmer. For all at school they are the best, but for those who suffer from cold and moist feet, or those who are liable to chilblains, they are an essential to their comfort.

Blankets.—It is better not to sleep too warm, for sanitary as well as moral reasons. All clothing at night should be

short of producing moisture of the skin in bed. It is more cleanly, less debilitating, and the body will be more inclined to get up in the morning with freshness. All the coverings to the bed should be freely pervious to air, and good absorbers of moisture (the insensible moisture that is always coming off from the skin), therefore blankets are the best bed coverings, better far than cider-down *quilts.*

The bedding, blankets, pillows, &c., should be allowed time to air and dry, so as to get rid of the moisture and organic matter with which they are saturated from their daily use. Yet, even in dormitories which are used for sleep only—still more in cubicles, where they must be ready for use immediately after first lesson—how few allow any ventilation of the beds and bedding at all; for as soon as the occupants are out of them they are re-made. Whereas, instead of being made up as soon as they are empty, the proper plan is to leave them open, so that mattress, blankets, &c., can be ventilated all day, and only re-make them when the windows are closed in the evening.

Moreover, the same plan should be followed in the vacation, and all the beds and bedding should be well spread out the day the scholars leave school, and there remain until they return; instead of which they are usually packed in a heap, and there the organic matter decomposes.

Well-aired beds.—There are few schools in which the well-known advertisement, which occurs in our homely country inns—"Well-air'd Beds"—could be inserted with truth.

Pupils go home for the vacation: their mattresses are stacked in a heap as soon as they leave; they are replaced the day before the return to school, and the pupils go to bed on them. This is the usual sequence of events in the history of the school-bed.

Now this is not as it should be; for unaired beds are a frequent source of ill-health: unoccupied beds get damp when not in use, and it is requisite, before the re-assembling of the school at the commencement of each term, that

every mattress, &c., should be carefully aired. This should be systematically carried out under the superintendence of the responsible master.

Dormitory morality.—I do not propose, nor would time permit me to discuss this question in its entirety. I cannot, however, pass it over in silence.

In boys' schools, at the head of these *dormitories* should be the best senior boys, or præpostors, that the house possesses.

Each of these boys should be responsible for the conduct of the dormitory under his supervision. He should be the trusted friend of the master, and of every upright and pure boy; but the enemy of every boy capable of any impure hint, word or act. By his personal influence alone he may, as I have known, keep the whole tone of a house—and especially of a dormitory—as pure and healthy as could be wished by even the most fastidious.

If small dormitories of two or three beds be already in existence, and must be used, the responsibility of the master in the choice of whom he should place in them is severe—too severe, I think, for such dormitories to exist at all; for on this choice may depend the whole character and after life of a boy.

Further, I cannot but regard *cubicles*—for sanitary and moral reasons—as the worst invention ever planned for schools; for evils are possible in cubicles and small rooms which are improbable, or next to impossible in large open dormitories, unless the house or school be corrupt to the core.

They are from my point of view a direct invitation to a boy to develop and teach secret acts, which he dare not and would not commit before a whole room; and I think no school has any right to put this unnecessary temptation in any boy's way, however good he may be.

> "How oft the sight of means to do ill-deeds,
> Makes ill-deeds done!"

To the thoughtless parent these cubicles no doubt do

look cosy and private; but it is this very privacy that is their evil, for they furnish an opportunity to a temptation to the commission of acts which could not be committed in a properly regulated open dormitory, having a senior boy, or præpostor, chosen for his *character* rather than his ability, at the head of it.

On parents, therefore, really rests the onus, if they ask for these cubicles, or place their sons where they exist. On their shoulders—not the master's nor the boy's school-fellows—rests the blame if their sons become corrupt.

Cubicles in themselves may be everything that can be wished for, where a healthy tone and conduct exist; but where there is the least unhealthiness in tone or desire—as there always is amongst a number—they foster it, and are an invitation to it by the privacy they afford.

In the large open dormitory the prefect can see all in the room, and for this purpose sufficient light should be provided. But the secrecy of the cubicle at once increases the power of the bad boy, and takes from the prefect the possibility of supervision.

The argument of those who advocate cubicles is that the open dormitory tends to vulgarity or coarseness of manners, through its lack of privacy.

If this were inevitable, I would yet say, Let us have this open coarseness of manners rather than that secret vice which undermines the whole character and constitution, and is the primary cause of a large proportion of the evil in "Society."

But, I would urge that this coarseness of manners is not inevitable; and I would maintain that with a properly constituted prefectorial system, dependent on *character*, as well as on *position* in school, the tone of a dormitory could be, would be, and ought to be, as good as could be obtained amongst human beings.

As I have entered upon the question of immorality in dormitories, I cannot conclude without saying that, in my view, it is the imperative duty of the physician to speak plainly of the conditions which foster it, so that he may do

his utmost to mitigate, if he cannot get rid of, a widespread evil. I am sorry to have had to speak of it, but it is so interwoven in the question of school dormitories that I should have failed in my duty had I avoided the subject.

My firm opinion is, that as soon as school authorities will recognise the possibility of the existence of this evil in *their own* schools more than they do—will face it rather than ignore it; will endeavour to prevent it rather than cure it—then, and not till then, will it be successfully met; and to *prevent* it, I can only repeat again, that nothing is more effectual than a reasonable prefectorial authority in large open dormitories.

POSTURES IN SCHOOL: THEIR INFLUENCE UPON PHYSICAL DEVELOPMENT.

By Noble Smith, F.R.C.S. Ed.

It is an important fact that a large number of persons become deformed during their growth. In the streets, in schools, and in every public gathering we may observe instances of such occurrence. Doubtless some of these deformities may have been produced by accidents and by disease, but posture has considerable influence as an exciting cause, and even strong children may grow up crooked if kept for long periods of time in bad positions.

The structure of the skeleton favours the production of deformity when constrained postures are maintained for long periods. The skeleton, although a framework, is unlike the framework of a house or ship, because the latter is a fixture in itself, whereas the former can be moved, one bone upon another, such movement being limited by ligaments, which bind the bones together, and by the muscles.

The human framework thus constructed would allow the body to collapse were not the muscles ever ready to control its action, and to maintain its varied postures.

The erratic movements of a drunken man show well how much the upright form depends upon control which he should exercise upon his muscles.

To understand how physical development may be influenced by postures, we must consider how the body grows, or rather, how the bones increase in length. If we examine the skeleton of a new-born child, we find the bones but partly ossified. At birth the ends of all the long bones of the limbs remain in their original cartilaginous state, the shafts alone are ossified.

It is easy to see how readily these ends of bone are moulded by unequal pressure, how growth in one direction may be checked while it proceeds unhindered in another. In early life ossific particles develop in these cartilage ends of bones and gradually grow, but it is not till puberty or later that the bones become complete. For instance, in the thigh-bone the head is not united to the shaft until the eighteenth year of life; the lower end until the twentieth. In the leg-bones the heads are not united to the shafts until the twenty-fifth year of life; the lower ends until the twentieth. The spine, which in respect to our subject is the most important part of the human skeleton, is formed of twenty-six bones placed one above another, but each is separated from its neighbours by elastic disks of permanent fibro-cartilage. These bones, which together form the spine, are in the first place, like the other bones, but cartilage, and they develop by the growth of several osseous points, which gradually unite, but do not terminate their full development until about the thirtieth year of life. The ligaments which join the bones together in the skeleton are weak in childhood. The muscles also are less able to support the joints in early than in later life. Thus it is seen that during youth the frame is fitted for free movement, for the activity so natural to the young, but is not suited for long sustaining the body weight in any one position. In

active movements pressure of one bone upon another in any one direction is but of short duration, and this activity is natural to the young. Young children lounge about, and play, and crawl upon the floor, and when in health are seldom quiet, except in sleep.

If natural activity is checked—if for instance, a child is made to walk or sit, when it would rather play upon the floor—irregularities of growth may be produced. Walking, though movement, is not natural activity, the body weight is thrown too much upon the legs. The arches of the feet give way, and flat feet are produced; the ankle joints get weak; the knees succumb to frequent pressure, and bend towards the centre of the body, knock-knees resulting.

Later in life the child may suffer from attempts on the part of the anxious mother, nurse, or governess at making it "sit up." Now this enforced "sitting up" is probably the commonest cause of spinal curvatures. The child when left alone will rest itself in various positions, either by leaning back or to one side, or best of all, when working at a desk, will rest its head upon its hands with elbows on the desk, and thus relieve the back from undue strain. How many governesses or schoolmistresses would tolerate such so-called "careless" habits? probably none. They try to keep their pupils straight, but then their plan defeats its object, and they produce the very evils that they are attempting to avoid. Let me explain the facts on which I base these views. When sitting upright, and without a back rest, the spine is held erect by means of dorsal muscles, these cannot act for long, they soon get tired, and then the spine subsides upon itself.

Let any one attempt to hold his arm erect above his head for long; he soon will tire, the arm will fall, because its muscles get exhausted. The muscles of the back are also soon fatigued, and the result is that the spine is either bowed out backwards or subsides laterally. If the child is weak or careless the spine will bulge out backwards,

and a "round back" will be produced. The back, however, may be held apparently upright with a very small amount of muscular exertion by allowing the column to subside laterally, until the joints between the spinal bones limit their further flexion. Under such circumstances, the equilibrium of the body is maintained by a double curvature, and the spine assumes the form of an attenuated S. Whether the spine is bowed out backwards or bent in lateral curves, it happens that at the concavity of the bends, where there is excess of pressure, the growth is much restricted, whereas at the convexity, where the pressure is less than natural, development takes place quite freely. Growth thus occurs unequally, and in course of time each bone which helps to make the curves assumes a wedge-like form.

It is a well-known fact that girls are more often affected with crooked spines than boys. The proportion of the former to the latter being six or seven to one.

In considering the reasons for this preponderance of the deformity among girls, it is necessary to study the differences in the lives of the young of the two sexes. From their infancy upwards girls are discouraged from playing and romping. The games they *are* allowed to play do not require so much freedom of action as do those of boys. As girls grow up more attention is given to their deportment, greater attempts are made to induce them to "sit up," whether at lessons or at meals. In short, all the factors in the formation of curvatures of the spine occur to a much greater extent among girls than they do among boys.

It is a false system to attempt to refine young girls by restraining their natural freedom of movement. It is this false process which does so much to encourage the production of deformity.

Long walks in precise and stately file produce a harmful strain upon the spine and legs, whereas free movement in such games as cricket and lawn tennis afford most healthful exercise.

After a long, uninteresting, formal walk, the girl returns to work, the muscles of her back are then fatigued from prolonged use in one direction, and when she sits she soon allows her back to fall into a curved position.

Marching in file is very necessary work for soldiers, it may be suitable for convicts, but it is not a proper routine exercise for girls.

Over-work, by causing general fatigue, impairs the pupil's health, so that her muscles and other tissues become less able than in health to sustain the body weight. Girls seem to be very easily induced to do a large amount of sedentary work, and they readily fall into the habit of neglecting physical exercise. It is therefore most important that their studies should be carefully arranged, so as to ensure a due amount of active recreation.

Girls are said to be more restless as regards their postures than boys; but is it not that the natural restlessness of young people is more noticed in the case of girls, and more often checked?

We have seen that if any one posture is maintained repeatedly for long periods of time without the body being perfectly at rest, the normal development of the skeleton will be interfered with.

The periods which may be called long, vary in accordance with the particular posture adopted. That which is a long period for one position, is a short time for another. Then, again, the periods which may be termed long, depend upon the health and natural strength of the child. A feeling of fatigue is a certain indication that a change of posture is required. I will now analyse a few typical postures.

Standing upright for too long fatigues and exhausts the muscles, and thus weakens them. The result is a gradually lessened ability to prevent the body falling into bad postures at other times. Standing with both feet close together is a very fatiguing attitude.

Standing upon one leg places the base of the back in an oblique position, and thus causes lateral curvature of the spine.

Standing and supporting the body with the hands upon a chair, or with the back against a wall, is better than not having any extraneous support at all, but it is likely to produce roundness of the back

Standing with the arms crossed also makes the back round.

Standing may produce flat feet and also knock-knees. In the latter case, the weight falls chiefly upon the outer side of the joints, and they gradually give way towards the central line of the body.

Sitting with the arms resting upon too low a table produces a round back, and if the right hand is used for writing, drawing, &c., the shoulder of the right side is raised more than that of the left, and the spine is placed in a laterally curved position.

Sitting with the arms evenly supported on a desk, or with the elbows upon a sufficiently high desk, and the head resting on the hands, are fairly good postures.

Sitting in a chair with a suitable back rest is a very good position, but it is quite possible for the back to be made "round" while in this posture by the pupil bending forwards frequently, and thus contracting the chest.

Sitting with the knees close side by side is a very fatiguing attitude, but I believe it is not considered elegant for a young lady to sit otherwise, unless she crosses the knees, and crossing the knees is also a bad position, and necessitates the spine being placed crookedly.

Recumbency in bed even may involve the assumption of bad postures. The body may be bent, the knees and head approximated, causing a rounded back. The pillow may be too high so that the spine is curved laterally in sleeping on the side, or posteriorly in sleeping on the back.

The above remarks may be easily applied to other positions than those described, but it is perhaps desirable to refer to playing upon the piano. This is necessarily a very fatiguing posture, even when the pupil uses a well-constructed seat which supports the back, and therefore

the time devoted to this practice should for weak children be of but short duration.

I have mentioned that round backs are produced by several positions. The appearance of the figure thus caused is perhaps the least of the bad results of this deformity. A round back involves the production of a flattened chest, and a constricted space for the lungs, heart, and stomach. A long paper might be written upon this subject alone, regarding the indigestion, the impeded circulation, and the lessened capacity for respiration thus engendered. I will here only refer to the lessened capacity for respiration. We are indebted to the late Dr. Hutchinson for almost exhaustive researches upon the movements of the chest, and the relations between the breathing powers and the health.

Among a host of valuable facts which he published was that which showed a certain standard of what he called VITAL CAPACITY for every individual of a similar height, weight, age, and sex. The VITAL CAPACITY of an individual is indicated by the volume of air which he is able to expel forcibly from his lungs after a full inspiration. At the middle period of life, the vital capacity *necessary for health* of a man measuring 5 feet high, is 174 cubic inches, while for a man 5 feet 10 inches, it is 254 cubic inches These measurements never vary in perfect health, and therefore, when the amount of respiratory power as thus indicated is diminished, it proves the existence of either distinct disease or, to say the least, it shows a lessened vitality.

Dr. Hutchinson also proved, and in fact it is a matter of general observation among medical men, that in people with round backs, the vital capacity is very much lessened, and it seems probable that individuals thus afflicted are more liable to become consumptive than others, and have less power to resist an attack of ordinary lung disease. We, therefore, have excellent reasons for doing all we can to prevent the development of round backs. I have found that by improving the posture an increase in the circum-

ference of the chest in expansion of from 1 to 2 inches has taken place in a few months.

Standing upon one leg is likely to cause curvature of the spine, by placing the pelvis in an oblique position, but I must mention that even standing with both legs upright may have a similar effect in many individuals. I refer to people in whom one of the legs is shorter than the other.

It seems that such a condition exists much more often than was formerly believed. The researches of Drs. Hunt, Cox, Wright, and Roberts, in America, and of Dr. Garson in London, show that equality in length of the lower limbs is an exceptional condition.

In fifty-four persons examined by Dr. Cox, only six possessed limbs of equal length—the variations ranging from one-eighth to seven-eighths of an inch.

Dr. Garson carefully measured seventy skeletons at the Royal College of Surgeons, and in only 10 per cent. of these cases were the limbs equal in length. The left limb was found longer than the right in thirty-eight cases (54·3 per cent.). The right was the longest in twenty-five cases (35·8 per cent.). The amount of inequality varied from one-twenty-fifth to half an inch.

I may mention that of fifty-four cases of curvature of the spine, in twenty-four one or other leg was found to be shorter than the other; and I have observed an important fact, which probably shows that in these twenty-four cases the deformity was dependent upon the postures produced by the inequality in the length of the legs. This fact is, that in twenty-one out of the twenty-four the short leg was the left, causing a lumbar curve to the left; whereas, in the three cases in which the short leg was the right, the lumbar curve was also to the right; in all cases, there was a compensating dorsal curve. In the other thirty cases (in which no inequality of the legs existed), the exciting causes seem to have been bad postures long continued, and frequently repeated.

And now let me add a few words with regard to the

avoidance of bad postures. In the first place, I must urge most emphatically, that in respect to girls, and they are girls who chiefly suffer, it will be utterly useless to attempt to remedy or prevent the evils I have referred to, simply by laying down rules regarding postures. Rules may be devised, and they have their value, but so long as parents and guardians entertain the idea that energetic action in play, and the adoption of easy postures at work, are unladylike and unbecoming in a girl, so long will weak and deformed backs, legs, and feet, and the want of good health which are thereby engendered, remain as common as they are in the present day.

Ladies who have the management of schools and collegiate establishments seem generally to be inclined to entertain more liberal views upon these matters now than formerly, but their endeavours to improve the physical condition of their pupils are often disapproved of by the parents.

At a large establishment at Ealing, where the advantages of free exercise are fully appreciated by the lady who has the immediate direction of the pupils, stately walks have been almost entirely abolished, and out-door games substituted. Of all these games, cricket is approved of by the girls above the others, and the enthusiasm with regard to this excellent game is very great. However, in some cases, the parents have raised objections to cricket, as being too unladylike for their daughters, and stool-ball has been recommended as a substitute. But such a game is far less beneficial than cricket; in fact, it is the very freedom and variety of movement, the energy displayed at one moment, the temporary easy repose at another; and also the interest which it excites among the players, which constitutes alike its excellence as an exercise from a hygienic point of view, and its unladylike nature from the point of view of the fashionable mother.

Tennis and fives, and many other games, may have their place among the recreations of girls.

Swimming has a great influence in developing the muscles of the spine, and in straightening a round back, providing, of course, that there is no lateral curvature.

Drill and gymnastics have their advantages, but they should be carried out in moderation, and be more carefully supervised than ordinary games. They are very useful in bad weather, when out-door games are less practicable. The Swedish systems of drill and gymnastics have become rather popular of late, and are valuable as means of exercise, but should not take the place of games.

With regard to postures in school. It is very desirable that children should be allowed much freedom of choice regarding their change of position. Standing in class should be avoided as much as possible, in some schools it is entirely abandoned. If the pupils are to stand at all they should not be obliged to place their feet close together, because by so doing the basis of support is made too small, and a greater effort has to be made to maintain the equilibrium of the body than if the feet are slightly separated. Standing upon one leg may be permitted, but each leg should be used alternately to support the body.

We find in this Exhibition many specimens of seats and desks specially made to allow school work to be done by the pupils in good postures. The fault which I have chiefly noticed in schools where these special desks and seats are used is, that the desks are too low, and that consequently the children are obliged to stoop to do their work.

The seat should be sufficiently high to allow room for the legs to move freely or to rest naturally on a foot-board. The back should be upright with a projection to fit the back of the pupil above the hips. It is best that the back of the seat should rest the shoulders whilst the pupil is sitting up reading. The seat should support nearly the whole thigh.

The edge of the desk should reach to within an inch of the body of the pupil when he is sitting upright. It should

be sufficiently high to allow the pupil to write without, or with a minimum of, stooping, the eyes being about 14 inches from the work.

The desks should slope 20° for writing and 40° for reading.

The light should come from the left hand of the pupil, so that it falls upon his work while he remains in a good posture.

Writing, as usually taught, is the occupation at which probably the body is most frequently placed in bad positions, but if upright writing were substituted for the present plan of sloped writing, the body might very easily be kept also in an upright posture. This plan of upright writing is most valuable, and its adoption in schools would do much to prevent the formation of curved spines. I might describe the influence of posture in other occupations of school life, but time forbids.

In conclusion, I will only add that if any one entertains a doubt as to the influence of the bad postures I have referred to in the production of deformity, let him consider the well-established fact that even in later life, when the bones are entirely ossified, the posture of the body has a material influence upon the form. Those who must stand for many hours together become flat-footed and knock-kneed, waiters in public restaurants are good examples of this fact. The seamstress, the clerk, the writer and engraver, show by their rounded backs and narrow chests how long-continued posture acts on *them*, and many trades show similar results; upon the other hand we find the country yokel with drooping shoulders and slouching gait drilled into a well-formed man.

Much may be done to change the form even in adult life, but if the body is deformed in childhood by injudicious postures, and the health ruined by over-work, then are produced effects which no amount of care in after life can quite remove.

ON THE ARRANGEMENT AND CONSTRUCTION OF LARGE MIDDLE CLASS SCHOOLS—GRAMMAR AND HIGH SCHOOLS.

By J. MURGATROYD, F.R.I.B.A., Manchester.

IT is not my intention in the following Paper to mention the productions of any tradesmen, or to refer by name to any particular school, but to put in a condensed form the results of my own observations and practice in the erection of school-buildings of the above class.

The question of school planning would afford material for a much more voluminous address than the nature of this meeting will permit. It has been already treated by several writers, more especially since the Education Act has encouraged the formation of School Boards, and the erection of Board schools.

I propose, therefore, to confine my remarks to one branch of the subject—schools for about 500 or 600 pupils of either sex, generally known as grammar schools, or high schools, in which the education of middle-class youth is conducted, and usually under the management of a Committee or Board of Governors.

I propose to allude to the questions of planning, heating, lighting, ventilation, constructive material, and fittings.

In the main features there is but little difference between a boys' and a girls' school. In details, there is, of course, much to be observed and provided for, according to sex, and to the peculiar circumstances of each case.

The general nature of the plan will be dictated to a great extent by the site. In a town school the space at command may be too limited for an open playground, and some provision may have to be made in the shape of a gymnasium or play-room inside the building itself.

The old arrangement of large schoolrooms does not

lend itself to modern methods of teaching, and it may be assumed, as a general rule, that separate class-rooms will be required, with perhaps one or more lecture-rooms for general assemblages of the pupils.

I will therefore attempt the description of such schools as, subject to the foregoing conditions, I have actually carried out, modified so far as my experience and observations extend, in the direction in which I would, if the opportunity offered, introduce change of plan or material. I will moreover suppose that we have to deal with a school for one sex only—viz. for boys; and I will then point out modifications required for girls.

There should be one entrance only, and this will serve as the exit also, though for safety, in case of a panic, other outlets must be provided, into the playground, or direct into the street—the latter should be regularly used and be situated as far from the entrance as possible—with outer doors or gates always open during school hours, and inner swing doors. These inner doors should either have a central post separating them, or the meeting edges should have a slice cut out, and the gap filled up with a slip of indiarubber one quarter inch thick, to prevent the jamming of fingers. Taking four feet as a minimum width of entrance for fifty scholars, I increase that by one foot for every fifty additional—thus, as an entrance for 600 pupils, I provide about nine feet. The other exit doors may be about half this width.

The entrance is under the supervision of a porter, who notes the arrival of every late pupil; he has in his lodge the command of the gas mains, with an index board and stop-tap to each branch, separate branches serving each floor or department. He has also a keyboard for electric communications and speaking-tubes, and an electric means of ringing a bell or bells for change of classes. Much of this ringing may be automatic. A regulator clock in the building controls it by suitable pegs actuating the bells at fixed periods. This regulator clock also works other clocks at different parts of the building by very simple mechanism.

Close by the porter's room it is well to have a staircase leading into the basement, down which each pupil descends into the cloak-room, ascending to the main floor again by another staircase after depositing umbrella and coat. The cloak-room should be large, provided with stands or horses and hook rails, umbrella stands, lockers for shoes, &c., and at one side should be a drying chamber, fitted up with galvanized iron drying horses, well ventilated, and capable of being quickly heated whenever the day is, or is likely to be, wet. This drying chamber is under charge of an attendant, who sees to the drying of wet clothing during the school hours. An adjoining chamber, also heated and fitted with perforated metal shelves, serves for drying boots. A simple arrangement of brass numbered checks serves to identify articles, and the presence of the attendant prevents pilfering. Hats and caps I prefer to have hung up in the corridors or near the class rooms.

We have now to consider the class-rooms and their approaches. The shape of the site must regulate this part of the plan. I much prefer the single corridor system, i.e. one or more corridors branching off near the porter's room, and arranged with windows on one side, and the doors to the class-rooms on the other. The walls or partitions dividing the class-rooms from the corridors need not be of brickwork. If the skeleton of the building consist of columns supporting girders, and concrete floors, these partitions may very well be made of wood framing for the lower part, and glazed with rolled glass above; this arrangement is not only cheerful in itself, but it affords the class-rooms an additional amount of light; while, by a suitable arrangement of swivel sheets or hoppers in the windows and partitions, a good cross current of air can be obtained, and ventilation very effectively secured.

If the class-rooms must be on either side of the corridors, there should by all means be a large window at each end of the corridor. A very excellent plan, which I carried out in a large girls' school, is to have the class-rooms on one side of the corridor, and on the other a

series of dressing-rooms, one for each two class-rooms; they are separated from the corridor merely by a dwarf screen, glazed; clear glass in the doors of the class-rooms gives the teachers in those rooms effectual control over the dressing-rooms. Each dressing-room has a couple of wash-basins under the window, while the closets form projections into the airing yard between the windows, separated from the dressing-room, however, by a short passage, with window on each side for cross ventilation.

Another plan, and in many instances a very excellent one, is to group the class and other rooms round a central area or quadrangle. In one large boys' school I have thus used the whole of the ground floor as a gymnasium—windows on three sides of it, and a large glass light in the centre of the ceiling. On the upper floors galleries are carried round the area from which the class rooms are approached, and the whole internal space is covered over at the top with a glass roof, with plenty of openings for ventilation. There is thus a current from outside across the class-rooms into the central space, and out at the top. The rooms are light and cheerful and thoroughly well ventilated; while the head master's room is so situated that from his door, which is glazed, he can command the door of almost every class-room and the greater part of the gymnasium below.

Whichever plan is followed, abundance of light should be sought, and if possible the class-rooms should have a northerly aspect, not due north if it can be avoided, but slightly east or west, so that the sun can enter the rooms before or after school hours.

Economy of construction will be found to result by making the class-rooms as much as possible of one gauge, and the corridors of another. For the former, about 20 or 12 feet will be suitable, the height 13 or 14 feet. The rooms should be arranged to hold classes of about 30 pupils, and one or two to hold 40 or 45. About 30 is the average number in a good school, and I like to give plenty of floor space—say 15 to 17 square feet per pupil. Single desks

with chair combined can then be used, and there will be fair space on each side and behind a class for the teacher to inspect the work. The window should be large; I prefer one large window to several smaller ones, on account of the shadows thrown by the intermediate piers; and this window should be to the left of the pupils and rather in advance of the centre of the room, so that the light will fall obliquely even on to the front row of benches. The teacher's desk, on a raised platform six inches high, will be opposite the desks, and the door entering the room on the left of the teacher.

The school will probably be three stories in height above the street level; one good roomy staircase should be near the main entrance, and another near the subsidiary exit before alluded to.

In a school such as we are considering, a dining-room will probably be required, with kitchen, &c. If these can be approached from a corridor shut off from the school corridors it is desirable, as also that there should be cross ventilation. Probably, accommodation for one-fourth or one-third the total number of pupils in a town school will be enough, and the cooking need not be on a very extensive scale, since many pupils bring their luncheons or dinners with them. The dining-room should be arranged with tables having seats for four or five on each side, and for a monitor at the head.

A large room for meetings, examinations, or combined classes will be required. This should be light, lofty, and well ventilated, and large enough to hold at least two-thirds of the pupils at once, affording each good writing space. A library and general reading-room, fitted with bookshelves and tables and chairs, will be a necessity: this apartment may also serve as the school museum. The bookshelves will be enclosed with doors, and, for the sake of ventilation, the doors should have neat wirework panels. If the book-cases are at right angles to the wall they may be back to back, the divisions between them being open lathwork. Thus quiet recesses for study are easily provided.

Besides the headmaster's or mistress's room, a committee-room will be required, and a common room for the teachers, reckoning one teacher to every thirty pupils. The teachers should also have on each floor a moderate sized dressing-room and lavatory. In a girls' school it must also not be forgotten to provide a small sitting-room and separate lavatory for the male teachers. A drawing-room should be provided; this can perhaps best be obtained in the upper story with a mansard roof and north light. I have found such a room, about 100 feet long by the same width as the class-rooms below, very convenient. It can easily be subdivided by curtains, while the light can be managed by blinds. There should be a special lavatory and wash-sink attached to such a drawing-room, for pencils and crayons make dirty fingers, and palettes and colour-cups require washing out. A roomy closet or two to hold spare casts should not be forgotten.

A laboratory is now an essential requirement in a large boys' school, and to a smaller extent in a girls' school also. For a school of 500 to 600 boys, a laboratory containing working room for at least 50 to 60 pupils should be provided, allowing about 4 feet 6 of table or bench-room to each. This apartment requires a good top light and also a few good side lights. Abundant ventilation is necessary, not only by exhaust-shafts for the room itself, but also by special earthenware pipe flues carried under the floor from the work-benches. The fittings of a well-ordered laboratory would furnish material for a treatise of no small length accompanied by numerous diagrams. Some excellent remarks on this subject by Mr. Robins are contained in the volume of the 'Transactions' of the Royal Institute of British Architects for 1882–3. I will therefore only remark that gas-burners and sinks, evaporating and draft-closets for each two pupils are necessary. Wall-recesses with light behind, covered in with glass and provided with gas and water, are essential; cupboards, drawers, shelves for chemicals; a lecturer's desk, facing the student's benches;

a room for the preparation and use of sulphuretted hydrogen ; a balance-room, with very firm floor and light falling on the benches ; a furnace for metallurgy; two or three small rooms for special classes and analysis ; an apparatus-room and a store-room for chemical materials and utensils, and, furthermore, a small lecture-room, are the least that can be provided for efficient teaching. The chemical lecture-room should accommodate fifty or sixty at least ; it should be capable of being made perfectly dark, and should have a lecturer's desk with sink, &c. Another requirement for this room is a glass case behind the lecturer's desk, with ample extract flue from it, and so arranged that materials for experiments can be introduced into it from the apparatus-room behind.

An open-air platform—on the roof possibly—is also a desirable acquisition for the performance of some experiments, which require more rapid dispersion of fumes than can be managed by the ventilation of the laboratory.

A physical science lecture-room will also probably be required to hold two classes ; it must have its lecturer's table and an apparatus-room, in which a small gas-engine may be placed to work a dynamo-machine for magnetic electricity.

I prefer to set out the seats in these lecture theatres, rather than to assume that a certain area will accommodate a certain number of pupils, though, as a general rule, six square feet each should provide the necessary accommodation, including space for lecturer, &c. The pupils require bench seats and a narrow ledge in front of them, on which to write memoranda ; and I have found it best to adopt the isacoustic curve for arranging the stepping-up of the rows of seats, i.e. to draw a line (on the vertical section of the room) from the lecturer's table over the head of one pupil, seated, to give the place of the eye of the pupil next behind him. We thus get steps gradually increasing in height as they recede from the lecturer, but the advantage is that every one can see.

A necessary adjunct to every large school is a book-room, in which, at fixed times, books, stationery, and drawing materials can be purchased by the pupils.

In a large girls' school, small rooms for pianoforte practice are required. About 10 feet by 7 feet is large enough for each of these, they should be in one block, well shut off by a passage and screen doors from the rest of the rooms.

Whether a playground be within reach or not, a portion of the basement may with great advantage be set apart for a playroom or gymnasium, and suitable apparatus according to sex should be provided. For boys, a dressing-room should be added, in which light shoes, flannels, &c., can be donned. The apparatus in a well-ordered gymnasium is very extensive, and each boy should be measured and weighed, and put through suitable exercise to develop the parts of the system that are below par. This should form a portion of the school curriculum, and a properly qualified teacher should have the management.

Lavatories with closets and latrines should be provided in convenient and easily supervised positions; it would be well to cut them off from the rest of the building by a communicating corridor with cross ventilation, and abundance of light and air should be provided. I must abstain from going into details lest I land myself in a lecture on sanitation, but I would advise the simplest possible kind of closet, with self-acting flushing arrangements, and no valves to the basins, nor any risers or other enclosing woodwork; latrines of well glazed material, and for which I should like to see a cradle-shaped arrangement of back, cheeks and floor, all in one piece, of glazed earthenware, without any square angles; wash-basins of the tip-up description, with short waste nozzles emptying into an open trough or gutter below the basins. I consider plugs and chains are decidedly objectionable; both hot and cold water should be laid on, and the taps be so arranged that they cannot be left open. The washstand tops cannot be kept properly clean in any other material than marble,

and I have always found that the use of this induces a certain pride in keeping them clean, which is not attendant on slate or iron. In all these arrangements strength and simplicity should be sought, and it must not be imagined that girls are less destructive or mischievous than boys.

Filtered-water taps and drinking-cups should be fixed in the corridors and gymnasium or play-room, and housemaids' sinks and water-taps may be contrived below them.

It may be thought that I have enumerated more rooms and more accommodation generally than is necessary, but I have not mentioned more than I have actually carried out in schools of the size we are considering. More even, or less, may be necessary, according to the requirements of each case.

I have yet to mention a few matters of construction, &c.

I believe the best construction to be, to make the walls solid and strong; to have as few division walls as possible; to support the floors on iron columns cased up with concrete, with rolled iron joists and concrete arching; to make the floors of the lavatories, &c., in asphalte, or cement concrete; to make all other floors of wood block paving, i.e. blocks about 9 in. by 4½ and 1½ in. thick laid solid in pitch on a level cement bed, and thus very materially to diminish noise. The partitions dividing the class-rooms from each other, of studding covered with fibrous slabs, or filled in with concrete and plastered. I think, however, though I have not tried it, that Willesden paper would answer well as a covering to the studding, and to fill the space with slag wool, or other sound resisting material. The partitions dividing the class-rooms from the corridors, of wood framing, and glass. Staircases of teak treads, and open iron risers, carried on wrought-iron stringers, and open on one side. I prefer such a staircase to one of stone between two walls, in which weak boys stand a good chance of being seriously injured by stronger or vicious comrades, and in which supervision is also more difficult. I would make all walls against which *there can* be any rubbing, of glazed brick or tile for stair-

cases, corridors, and lavatories, and lined with a plain wood dado elsewhere.

Lighting.—Electric lighting will probably soon be universal in schools—meanwhile gas-lighting must be relied on. I dislike sunburners very much on account of the reflected heat on the heads of the pupils, and I prefer open gas-jets. The ordinary gas pendants are unsuited for schools. I have found a horizontal pipe, with a proper number of burners on it, suspended well up, and in advance of the desks, or at right angles with them, the best for class-rooms. The other rooms must be lighted according to their special requirements, but it must not be forgotten that the cubic space to be lighted has to be considered quite as much as floor space, and one burner for every 800 cube feet will generally be found sufficient.

Ventilation.—Besides the windows, I like to bring in a supply of fresh air on what is called the Tobin plan, carrying the flues, if necessary, under the floor to the points where they have to be brought up. I prefer natural cross-current ventilation, as far as possible, for the removal of foul air; but, besides this, wherever I can arrange a good sized and lofty ventilation turret, and carry up its centre an iron smoke-flue from the heating apparatus or hot-water apparatus, in order to excite an upward current, I always do so. Such a turret is especially valuable for the reception of foul air shafts from the drying-room, dining-room, lecture-rooms, laboratory and lavatories, taking care so to arrange each shaft entering the turret with an upward arm as to direct the current, and to prevent commingling. By a proper arrangement of heating-surface in the turret a velocity of the ascending air of 100 to 150 feet per minute may be easily secured, and bearing in mind that six to eight cubic feet per minute per head should be extracted from every room in connection with it, the areas of the different shafts, and inlet apertures, may be easily calculated.

Heating.—I have tried several systems, each of which has its advocates. I find that air heated by a stove in the basement, and carried to the different rooms by flues,

is generally too dry, and much heat is undoubtedly wasted in the flues. Hot-water pipes on the low pressure system may be made very effective, but they are unsightly; they should never be buried beneath grids in the floors, but always be kept above the floor, and sufficiently removed therefrom, and from walls, to allow of dust being easily swept away from them. The small-bore hot-water pipes are less unsightly, and with proper fitting are very efficient, but I believe the best arrangement of all will be found in the use of steam. Steam may be carried anywhere; it is easily controlled, and is economical. The pipes need not be exposed where they are not required to give off heat, and by the use of coils on the window side of the rooms, under which a supply of fresh air is brought, or by an arrangement like a German stove in the corner of a room, I believe the best effects may be secured. For a school, except in some particular rooms, I believe the use of open fires is both costly, uncleanly, and unequal in its distribution of the heat.

DISCUSSION.

The CHAIRMAN having proposed a vote of thanks to the gentlemen who had contributed Papers,

Dr. ROTH said he would make a few remarks on Mr. Noble Smith's Paper. It was a very interesting Paper, but he did not confine himself strictly to the title, as it was really an essay on physical education, a subject which had been hitherto entirely neglected in schools and colleges. He agreed with him in many of his observations as to the effects produced by posture in schools, but it was not that alone which caused deformities; a child must be predisposed to it, and then bad posture would increase the tendency and produce round shoulders, flat chests, and curvature of the spine. The first requisite was that the

school hours should be interrupted more frequently; little children should never be in school for over three-quarters of an hour without running into the playground perfectly free to do what they liked, and then when they returned to school they were much more attentive. The positions in school could be classified into those required for reading, for writing, and for drawing. Music was not usually taught in public schools. The child should always have something to lean upon, and should never be upright; but in order to lean the proper furniture must be constructed, which with very few exceptions, did not at present exist. As had been stated, there should be support given above the hips with a good concave-shaped chair. Twenty-five years ago he called attention to this subject, and published tables of all the positions assumed during school hours, and since that time attention had been more directed to the matter, but he could never get the right chairs introduced. At present the North of England School Furniture Company, to whom he gave some drawings a few years ago, were making just such chairs as Mr. Smith advocated. Then with regard to the distance of the desk from the chair, the best way was to have the desk movable, so that it could be brought forward into the proper position without the person who was seated wriggling about to get close to it. For reading the desk required to be at a different angle to that required for writing and for drawing; there should be a little contrivance on the desk on which the copy or model could be placed. With regard to standing, it used to be the rule to stand in school with the arms across, and the two feet close together. That was not so general now, but it was still to be found in some places; and if you paid a visit to almost any school whilst the children were writing, you would see them in all sorts of unnatural positions. If you asked the teacher why they were allowed to occupy that position, you were sometimes told that the inspector insisted on it in order to prevent them seeing what their neighbours were writing. Mr. Smith also alluded to the necessity of encouraging games to counteract these

strained positions, and improve the general health, and that was all very well, but games alone were not sufficient; every child as he learnt to read or write should also learn to make use of his body. Allusion had been made to the Swedish gymnastic system, which should be called the Ling system, as he was the inventor of it, and for thirty years he had been trying to get it introduced, but only this last year had he seen the School Board for London making a beginning, and acknowledging that it was desirable to develop the body by systematic exercise. It was not necessary to have any apparatus. The floor of the room and the brain of the teacher were the only two apparatus required, and this could not be too forcibly insisted upon when there was such a tendency to spend large sums of money on gymnastic apparatus. Another cause of bad position was dress, especially with regard to ladies; they wore thick petticoats and other garments of wool, and when they sat down they put them on one side, which made them sit slanting, thus inducing a curved position of the spine. The science of physical education was too much neglected, and he wished to call the attention of all those interested in education to it. In the French Exhibition there were the celebrated figures of Dr. Ogan, showing all the various parts of the body in *papier-mâché*, which could be taken to pieces, by means of which it was possible in the course of a few lessons to give every teacher an excellent idea of the different parts of the body. At present this matter was generally attended to by drilling, calisthenics, and dancing-masters, persons who had not the slightest knowledge of the human body; no doubt thay tried to do their best, but they did not know that it was extremely bad for one child to perform the same exercise as another. The only way to avoid deformity in children was to begin with the teachers.

Dr. CHARLES DRYSDALE was very glad to see that people were now attempting to find out how to bring up young people so that they might arrive at a good old age. Of course, if their health were not attended to when they

were young they were not likely to attain the age of ninety. He had lately been making some observations in France in a school constructed by M. Raubat, a scientific man who was thoroughly acquainted with education both on the Continent, in England, and in America, and in fact seemed to be an epitome of knowledge of all the school teaching in the world. He had set up this place, having the care of a number of children from the city of Paris sent from the Conseil Municipal, and the whole expense of the establishment for 130 children was £4000 a year: nothing like the enormous expense spoken of by the reader of the first Paper, who spoke of £250 being paid for each child. M. Raubat had adopted the American system of educating boys and girls together; and he felt certain that this was one solution of the question brought forward by Mr. Noble Smith, who referred particularly to the fact that girls were allowed far too little exercise. In this school the boys and girls were all brought up together, and the consequence was they had exercise in common. There was a large bath, where they were all taught to swim. In addition to that there was a large piece of ground for agriculture, and the children were all made to attend one or two lectures a week in the fields. They not only played cricket, but attended to the farming operations, so that their amusements were not only interesting to them, but were conducive to the rearing of the crops, and they looked after the young animals on the farm, and were taught how to become good agriculturists. Five hours in the day were devoted to the class-rooms, which he thought was at least half an hour too much, for it was a great pity to keep young children too long a time in school. Every half-hour or so the children were marched out to the sound of their own music, and came back again in good spirits; they were all taught vocal music by an able musician. With regard to the details of the dormitories, which were so well spoken of by the medical officer from Rugby, he might say that about 650 cubic feet were allotted to each child, and that appeared to him, if the windows were open at the top, to be enough.

He inspected the whole of these children, and did not find anything the matter with them, except two who had tubercular affections of the lungs, which was not to be wondered at, seeing that they came from Paris, where the malady was so prevalent. Amongst the whole of the children he did not find a single case of contagious disease; they were all so much out in the open air that when they got into the bedrooms they fell asleep in five minutes, and there was no appearance of languor or anything of the kind. He should also say that they were taught printing and carpentry, and had built for themselves a house at a neighbouring seaport. In that school, therefore, most of the matters which had been so insisted upon were carried out in a most economical form, and he had no hesitation in saying that that was the sort of school of the future. In his opinion it was very desirable that under the age of fourteen the sexes should be taught together. If the boys were taught separately they became rude and unruly, whilst the girls did not get half enough exercise. There had been a good deal of preaching, and they were all very fond of preaching to women, and keeping them in order, but it was too much to ask a woman to be so clever as they would like them to be when they did not give them anything like the boys' education. The time would come when women would take their place exactly in the same position as men, but it would be only when they had the advantages of the same education as was given to boys.

Mr. JABEZ HOGG, after referring to the efforts of Howard in the cause of sanitary reform, and also to those of Dr. Southwood Smith, pointed out how desirable it was that medical men should be consulted with regard to the architectural arrangements of schools and other buildings. The lighting of schoolrooms was often very defective, and together with bad ventilation produced very serious results on the eyesight of the children. The children in Board Schools particularly were not nearly enough considered in these respects. They were placed in positions which afforded very little light, and were obliged to study under

very great difficulties. Bad light compelled them to look very close to their reading, which produced short sight to a large degree. It also had a tendency to produce sleepless headaches and other disorders.

Dr. ALDER SMITH desired especially to thank Dr. Dukes for his admirable paper on school dormitories. The great difficulty in these things was that large schools already had their rooms arranged and could not enlarge them. At Christ's Hospital, for instance, they could not enlarge the dormitories, though if they moved into the country no doubt due attention would be paid to this matter. He looked upon the cubicle system as an abomination in every way. Usually the same room for sleeping in and studying was incompatible with proper ventilation. With regard to the cubic space, he quite agreed that most schools had not sufficient space. Even in Christ's Hospital they had not as much as he should like to see, although there was more than in some other schools. There was rarely less than 350 feet, and in many wards 600 to 700, but he should prefer to have 800. With regard to ventilation, cross ventilation by windows on the opposite sides was very advisable, and in all their wards they had windows on either side, so that whichever way the wind blew they could ventilate their rooms. In some wards they had Tobin's ventilators, and they were going to be introduced into all. There should be always a good light at night, and that might be made use of to ventilate the room by carrying the heat up the chimney. With regard to the sanitary condition of schools, few would believe the abominations that existed in many places. They looked nothing to the ordinary eye—a simple little catch-pit or sink under a tap; but where did the waste pipe go? It might go directly into the drain; and many a boy had been seriously injured in health by such things, which introduced bad air, and produced a low form of fever, typhoid and pneumonia. A very cheap and simple mode of ventilating ordinary rooms in small schools was simply cutting three or four inches over the top of a door,

and fixing a slanting piece of board to direct the air towards the ceiling.

Miss EDITH LUPTON (Member of the School Board for Bradford) said she should like to know what was the best mode of lighting schools. In Bradford schools were lit with windows down both sides; the children were placed opposite on long benches reaching down the side of the room, so that they had in the first place the light coming over their shoulders, and in the next a whole row of windows facing them. She had no doubt that was bad—in fact their medical officer of health had expressed the same opinion—but she would like to know the best way of remedying it: if the benches were changed so as to have one row of windows to the left, whether it would be objectionable that the light should come in from the right also. Another great difficulty was as to the best mode of ventilation in elementary schools. They had large rooms in Bradford with the full cubic capacity required by the Government, but they were extremely badly ventilated, and in fact they found it quite impossible to get proper ventilation; and, from some visits she had paid to other institutions, she came to the conclusion that Tobin's ventilators were the best, and they were adopted in many Board Schools, but she had been told by many persons that they did not like them. The most common plan in Bradford was to ventilate by opening the windows, but that seemed a bad plan, and the parents complained that the children sitting with their backs to the open windows got lumps in their necks. Everything there was referred to the Clerk of Works, and he placed large ventilators in the roof, and opened a ventilator above the windows, so that no fresh air ever came into the bottom of the room; her idea was that you should not only have an aperture at the roof, but also an opportunity for fresh air to come in at a certain point low down in the room, but she would like to know exactly where that point should be. There seemed to be an idea in the minds of some people that a large hole in the roof was ventilation, forgetting that

there was no opportunity for fresh air to enter. She knew a large girls' school in which there was a large ventilator, but it was always tightly shut, because it came right dowr on the teacher's head, and produced such a draught that she could not stand it, and consequently there was absolutely no ventilation in that school. In a recent publication it had been stated that as a rule in Board Schools cold air would not descend, but she pointed out at the time that that entirely depended on the difference in temperature between the outer air and that inside; and in certain conditions the cold air might strike down directly on the heads of the inmates; but, although she could see these defects, she had not yet arrived at any definite principles as to how ventilation should be carried out. They had lately built four large schools in one building, two in the lower storey and two in the upper storey. In the upper storey there were four ventilators in the roof, but in the two lower rooms there were no ceiling ventilators at all. Surely the children in the upper storey and those in the lower required the same amount of ventilation, but they were assured by the papers that the school was well ventilated, because the upper rooms were riddled with ventilators, though there were none whatever for the lower rooms. On these points she should be very glad to have some information from the medical gentlemen present. Another point of great importance was the entire ignorance of the teachers on the subject of hygiene, and until this was overcome proper measures would never be carried out. She heard the other day that any one who looked at the time-tables would see that proper care was taken of the health of the children; the time-tables stated that infants should have a quarter of an hour in the morning, and a quarter of an hour in the afternoon for recreation, but for the elder children only a quarter of an hour in the morning was allowed. There was another regulation which she got inserted, that in case of stormy weather the children should march in the central hall, having the windows open. These regulations looked very well, but they were never carried

out, because the teachers did not believe in them. When she went round as a kind of inspector, she generally timed her visit so as to be there when the children should be having their quarter of an hour's recreation, but nearly always found them in the room. If there were a little mist the teachers declared it was stormy, and then if you asked why the children were not promenading round the hall, they said they really had not time, and looked so distressed and anxious as to make one feel quite heartbroken at suggesting such a thing. She insisted so much on the necessity that in fine weather the children should go out that the teachers seemed to resent it, and when they were compelled to carry it out they formed the children in a long line, and paraded them out in the playground, then slowly back again, so that the whole time was occupied. They said the children must not make a noise and be disorderly, and therefore they were marched slowly out of the room and back again, and that was all the recreation they got. When you had intelligent, able, upright and well-meaning men and women steadily setting themselves against any physical recreation what were you to do? One lady at the head of the principal girls' school, when she impressed on her the desirability of having gymnastics, said they simply had not time, the Code did not allow it, whereas they ought to be all impressed with the fact that physical recreation would enable the children to get through more work in the time at their disposal than they did at present. The teachers would not believe this, they believed in keeping the children close at work one hour after another, and did not understand that five minutes' interval would enable them to get the work done better. Children were sometimes kept there from nine to one without five minutes' relaxation; one day on going into a girls' school after twelve she found about thirty girls in the schoolroom, and on asking why they were at work, the teacher said they were naughty; she remarked it was very astonishing there were so many naughty children, and was told they would not do their spellings, and must stay in until they had. It seemed to be the rule that if the

children were so stupid, or the teacher was so stupid, which was very often the case, that they could not do their spelling they had to wait in until one o'clock, and they had probably not been allowed the quarter of an hour at eleven, so that they were actually confined from nine to one. Yet these teachers were intelligent, instructed people, only they were not instructed in hygiene. A thorough condemnation of this system by such a meeting as that would do a great deal of good, for until they did make the teachers understand how essential all these physical exercises were to the mental health of the children they would never be generally adopted. She knew a German gentleman who was brought up at a time when German schools were very severe, more so than at present, and he told her they could never have got through the work they did if they had not five minutes in the playground in each hour for gymnastic recreation. If they could only make teachers, and the public in general, understand this it would do great good to all the children in the schools.

Dr. FRANKLIN TAYLOR (Philadelphia) said he felt a desire to go to Bradford immediately; he did not know how the numerous questions which Miss Lupton had put were to be answered, or what might be the proper means of solving the different problems she had put forth, but he certainly thought that Association ought immediately to send a delegation to Bradford to hold an educational conference there at the earliest possible date. People used to say, at the time when Naples was under the King of the two Sicilies, that if you wanted to know how to govern a city, go to Naples, and find out how they do things there, and then go home, and do exactly the reverse. He did not know anything about the schools in Bradford, but if the statements they had just heard could be verified in every instance there must be very great work to be done there. He did not propose to answer the questions, because, as President Lincoln said when engaged in putting down the Rebellion, "it was a very big job," but he was quite sure that the Conference had helped to solve the difficult

problems which had to be answered in Bradford, and a great many other places. It was with a great deal of pain that he heard the question of dormitories discussed at all; and he was afraid from what he had learnt from English literature in regard to life in English schools and the customs that prevailed there, from the early poet, the author of "The Task," down to the latest, that there were many things connected with those great schools which could not be sustained in the coming civilisation. At the present time the population of the cities was being greatly enlarged at the expense of the country. When he as a boy first came to London it seemed to him a very large city, but to-day it seemed as if it were extending itself all over Middlesex, and he did not know how many counties it would cover in the course of another fifty years. The problem of the future was how to have the best-managed schools for these large cities. He was not very much in favour of large schools at all, and thought 900 boys at Eton was entirely too many for either the new head-master or any other to manage, however good he was. He hoped the new master was going to be A1, but he did not know of any man—perhaps Dr. Arnold might have done it—who was able to take 900 boys in any school, and do what ought to be done to them. He was in favour of large steamships—the larger the better—but a large school was a very difficult thing to manage, it was as difficult as a great army, and it was much more important sometimes to know how to manage it. Neither was he in favour of very large classes One of the papers referred to class-rooms for forty-five, fifty, or sixty. He did not think any teacher could well teach, unless in a mere formal lecture, more than thirty pupils in a class at one time. The problem they were trying to solve in America was how to conduct schools in such a manner that all the best citizens would desire to send their sons and daughters to be educated in the schools controlled by the authorities of the city, and they found that it could best be done by diminishing the size of the schools. In the central high schools, receiving the picked

scholars from the other schools, they had a larger number than he thought they ought to have, and what they were proposing was to divide it more, and not have so many together. In the school they came at a certain time in the day, and at a quarter before two they returned to their homes, and it seemed to him home was the best place for a child to sleep in. He should fear to send a son of his to sleep in many of these large dormitories. He should not like to send him there on the ground of ventilation, and on other more important grounds than that. After giving a graphic account of the bad ventilation in a London theatre, and the terrible draught produced by an open door in order to allow a little fresh air to enter, Dr. Taylor continued that he believed a large number of boys in the vacation were in the habit of going to these places of amusement, and might then go back to school at the commencement of the term, and break down in health from exposure to draughts such as he had described. The problem of how to train up children, and how they should enjoy their time for rest after the hard studies at school, were the problems of the future, and in his view it would best be solved by an endeavour so to combine the family with the school that each day the children should be under the supervision of their parents.

Miss WILLIAMSON said she found it absolutely necessary for girls' dormitories to be warmed. Perhaps Tom Brown's experience, that the pleasure of endurance was dear to Englishmen, might not apply to girls, for she certainly found that delicate girls suffered if the bedroom was not warmed in going into it, and getting up in the morning. Their dormitories therefore were well warmed, and she did not find any disagreeable effects. She had gone in late at night when the girls were all asleep, and always found the rooms quite fresh, and air not too dry. There were also one or two points she should like to touch upon in Mr. Noble Smith's paper, and first with regard to writing. Some objections were always raised to upright writing; it was not considered to be so elegant, and she did not think

it was so legible as sloping writing, and certainly it was not so economical as regards space. At any rate she thought all difficulty could be obviated by the position of the paper, the slope of the writing ought to be quite at right angles to the body. She had paid some attention to this subject lately, and had been rather laughed at as a visionary, but at the same time there was a great deal to be done with regard to writing. The muscles of the hand were a little apt to be forgotten in the matter, but they were as important in some respects as the other muscles of the body. In her opinion lessons in writing ought to begin by exercises of the muscles entirely, until the hand became so flexible that it would form a stroke of any length, and with any degree of firmness, before the writing was begun. This had been lately advocated by a gentleman who took a great interest in teaching drawing in the high schools. He advocated teaching writing by drawing, and this she believed was the shortest road; but with regard to the point in question, children would write much better, more quickly, and in better postures, if they were taught to exercise the muscles of the hand first. By putting the paper at a certain angle to the body on one of the comfortable desks which could now be obtained, the stroke of the writing could be at right angles to the body, and yet sloping. This was perfectly compatible with a child sitting quite straight in front of the desk with her arms to her side in the way Mr. Noble Smith advocated. She formerly advocated putting the left arm on the desk, but since seeing the diagrams which Dr. Roth had referred to, she saw how injurious it was, she changed the position, and found it was perfectly easy to adopt the other system, and to sit perfectly square to the desk with the shoulders quite down. With regard to the question of posture, it would be difficult to find one position, however comfortable it might be, which would always be used. They had tried the Glendinning desk, and even this seat, which was perfect as far as one seat could be perfect, did not always answer the purpose, for even with those girls would take some-

times the so-called bad position, and lounge when they had an upright back, and the desk perfectly in front of them. The cure for this was a great deal more variety —shorter time for work, and more exercise, combining recreation for both mind and body. That was the reason why active outdoor games were so much better than stiff walking. Games, however, were difficult to arrange; there was a great tendency to think that any kind of active free exercise was unladylike, but she hoped they were coming to a better state of things, and that parents were beginning to see that if they would exact this high pressure education, and that all girls should attain a certain standard, they must afford them the same physical exercise as boys had had in days gone by, and that the very fact that boys had been allowed these games accounted for their intellectual acquirements. This was quite possible, but she did not think a mixed school would ever answer here; it was perfectly contrary to the prejudices of the English mind, if they were prejudices, and certainly it had its disadvantages. It was quite easy in a large public school to so arrange that girls should have the same amount of exercise as boys were allowed. She was sure no boys, with every advantage they could have had in the way of arrangements, could take more interest in, or be more active about cricket or tennis, than they had found girls to be. The great thing they really wanted was a proper dress. Boys had a dress for cricket, and girls must have a dress for it too, and she hoped before long they would be able to adopt some kind of dress which should be warm, and yet allow full play to the limbs without being in the least degree pronounced. It ought to be such a dress that girls could sit in after they came in, or be able to wear when they went out again without having to change their dress. She feared, as long as we had such bad print and still worse paper, no desk would ever help them much in the matter of eyesight. They owed a great debt of gratitude to Messrs. Cassell and Co. for the beautiful print and paper they were using, and she was glad to see they were proposing to issue educational works with the same

paper and print as was used for their lighter books. There was far more curvature and tendency to stoop amongst girls than boys, but then they must remember the high pressure under which they had been living, and which was to a certain extent undermining the constitution; she fully believed that the set posture advocated by our grandmothers had operated injuriously on girls of the present day, who were not able to stand as well against the pressure of society as the boys were, and therefore their muscles got out of place much more easily.

Dr. JOHNSON MARTIN, of Bolton, had listened with great pleasure to the Paper, which did not leave much more to be said; but he would point out one thing he had often noticed in visiting schools, and that was that the desks were all of one height, no matter what the size of the children was. With regard to ventilation, he had seen a plan which was very useful in some cases, of having a sliding skirting board, which allowed free ingress of fresh air; of course it could not be kept open continually, but when the children were out at play a good supply of fresh air could be admitted in this way. With respect to position, there was no doubt that if a girl or boy had to lean to read or write it impeded the circulation of blood through the body, and thus produced indigestion, headaches, and further mischief. If digestion failed, the growth of the body was not carried on as it ought to be, and the child could not learn as it otherwise would.

Mr. NOBLE SMITH said the most practical remarks had fallen from the two ladies who had addressed the Conference, and they were much indebted to them, for ladies were often in possession of information, especially with regard to girls' schools, which men were not. There could not be a better confirmation of the necessity of his paper than the remarks which had fallen from Miss Lupton with regard to the condition of the schools at Bradford. With regard to the light, it should not come from anywhere except the left hand. With regard to vacations, and the point mentioned by Dr. Taylor, it occurred to him that perhaps if a little less time were given to vacations and a

little more recreation were given in school time it would be a great improvement. The idea of having five minutes during each hour seemed to be an excellent plan; there was no doubt that recreation must be provided for, and the public and those engaged in teaching must take up the matter heartily, for it was no good having rules unless they were carried out. As to the children marching out in lines like the pictures of animals going into Noah's ark, and coming back again, there could not be much exercise or recreation in that. It must be remembered that education was not confined to teaching the people literature and such other subjects as were ordinarily taught, but it really consisted in bringing out the whole faculties of body and mind, and what children are to be must depend upon how they were educated. It was no good bringing up a child to be very learned at the disregard of his bodily health.

Mr. JABEZ HOGG said he preferred the light on his right hand. He thought in the case Miss Lupton referred to it would be better to divide the room in the centre, and arrange the benches in another direction.

A vote of thanks having been passed to the Chairman for presiding,

The CHAIRMAN, in responding, said Dr. Dukes' Paper was pregnant with information and suggestions, and made any one who had boys at a public school feel how much depended upon the mode in which those institutions were conducted. The outcome of the whole Paper was, in his opinion, to show that the thing would never be right until there was public inspection of all great schools, as there was of asylums. The children were perfectly helpless, and they needed the protection which Government alone could give. No one could go through a large school without seeing that if there was a fire the whole of the inhabitants would be immolated, every window being barred so as to prevent egress or to protect them from being broken; the parents could not insist on what the children ought to have, but the Government could.

Conference on Friday, August 1, 1884.

SUBJECTS FOR DISCUSSION:—

12. "*The Development of Boys.*" By Walter Fergus, M.D.
13. "*On the Use of Gymnastics for Children of Both Sexes.*" By R. von Schweizer.
14. "'*Feriencolonien,' or Holiday Colonies.*" By Edward F. Willoughby, M.B. (Lond.)

The Chair was taken by Edwin Chadwick, C.B.

THE DEVELOPMENT OF BOYS.

By Walter Fergus, M.D.

Medical Officer of Marlborough College.

When I accepted the invitation of the National Health Society to furnish a paper in connection with this Conference, I was to a certain extent at a loss regarding what part of school life I should adopt for treatment. The Development of Boys was thought to be a fitting subject to bring before you.

To observe the gradual increase of the human frame from childhood to manhood is a most interesting study at all times; but when one lives amongst and watches a mass of boys as in a public school, the interest is greatly heightened, and the results are more clearly seen than is possible in general life. The development of boys means not only their physical growth, but also their mental and moral progress. All this is obviously dependent on the

surroundings and circumstances in which the boys find themselves.

These surroundings vary in different countries. There are schools for the training of the young in all places. But it would far exceed the limits of a short paper to make even a reference to the schools of various peoples. It may nevertheless be well for a moment to contrast the surroundings of an English and of a French schoolboy. Our English schoolboy enjoys the fullest freedom of body within such limits as have a constant tendency to the healthy development of the bodily and mental powers. The French system has the questionable advantage of rigid uniformity throughout the various ramifications of the scholastic system of the Empire, and so the surroundings of the French schoolboy are entirely in contrast with the English system, where variety and divergence, both of rules and of traditions in each large school, are found to exist.

Attached as I have been for a period of thirty-five years to Marlborough College, a school which is now in its forty-first year, it follows that the development of the school has taken place almost entirely within the period during which I have held the post of medical officer. Looking back to the time when I first became connected with the school, I feel great interest in noting the progress that has taken place, and the development that has been accomplished both in the school itself and in the boys that constitute the life of the school.

Though it would be out of place for me to confine myself to a history of Marlborough College in the matter of the development of boys, I must in a sense base what I have to say upon what has passed under my observation during the period that I have mentioned.

Before speaking of the special subjects of the paper, I would for a moment glance at the past history of the science of Hygiene. It is not many years since hygiene was spoken of as a new science. Workers in matters of sanitation felt that they were powerless and greatly thwarted by the entire ignorance of the general population in matters

relating to health. One of the earliest and most cultivated of the earlier workers in the great question of public health was the late Sir James Clark, and it was mainly owing to him, and his influence, that Andrew Combe, Edwin Parkes, and a number of other gifted men, were enlisted in the great work of sanitary science. Perhaps, considering the date, no man did more than Andrew Combe, whose life was devoted to rousing public attention to the main points that are now worked out in minute detail by the earnest workers that we are now privileged to see gathered round this great Health Exhibition. Combe's work fell like a flash of bright light upon the world.

Modest man as he was, he timidly launched his unpretending volumes; but to his astonishment his work spread like wildfire. It was translated into numerous languages. One edition in America sold 30,000 copies in a wonderfully short time. The rules laid down by Combe, and others who followed him, are applicable for guidance as much now as they were when they appeared as novelties.

There is no question that school ought to be, in the matter of development, the fittest place for the young.

It is a matter of general observation that boys grow up more healthy, more intellectual, and more moral men under the training of a public school than they are apt to do under the so-called comforts of home life.

One of the great benefits conferred upon many boys is the counteraction of faults in home habits and home feeding.

Speculations are rife as to the causes of the premature decay of the teeth, the weakly lives of many of the rising generation, and the general faultiness of the constitutions of children. I am well convinced that a great deal of this is caused by the mistaken kindness of fond parents. I have seen children of two and three years eating highly seasoned sausages, and other equally unfit food at the breakfast table, while the wholesome meal in the nursery is left untouched. It is to this erroneous feeding of young children that I would attribute much of the faults of development that we meet with in the youth of the present day.

The correction of these faults is, or ought to be, attained by school life. The regularity of hours, both of work and of play, of food and of rest, tends much to aid the healthy development of the bodily frame, of the mental capacity, and of the moral qualities.

The hours of work are, or ought to be so arranged as to give a complete rest to the mind in the intervals devoted to recreation and taking food. Our school day in summer begins at 7 a.m. and closes at 10 p.m., giving fifteen hours; of these on full work days eight hours are given to work, and on half holidays the work is lessened by two hours and a half.

The supply and regulation of food is one of the greatest of the elements in the development of boys. A sufficient time should be allowed for meals, and attention must be paid both to the cooking and the variety of food. And while there should be an ample supply of wholesome food, yet there is a great evil in school-boy life in the wasteful excess that takes place in the matter of eating. I am well within the limit when I say that quite one-half of the illness in the school arises from errors in diet. A great deal of this lies at the door of parents, who send enormous supplies of indigestible food in hampers to their boys at school. The arrival of a hamper is almost certain to be followed by the illness of the recipient, and often of his friends. Beer and other stimulants are, in my opinion, quite uncalled for in the diet of the young.

The hours of recreation should suffer no curtailment, as they are apt to do by extra lessons, detention in class rooms, and other methods, which over-zealous masters are apt to put in force.

No healthy development of a boy can take place without an ample provision for out-of-door exercise of all kinds. Good open playing fields, free from bottom moisture, and well exposed to the winds of heaven, are essential for a school.

The question of games enters largely into that of the development of the bodily frame. Football, cricket, hockey,

gymnasium, swimming, have all a place in the programme of a school, and to these may be added, racquets and fives.

Of all games, football has the foremost rank in a school, and I think most justly so. When it is played as it ought to be, the risk is reduced to a minimum. No one can look upon a game of football played by boys and young men, without seeing in it an admirable means of bringing into action every muscle of the body, while at the same time activity of mind and thought are stimulated in a striking manner. Most of the outcry against football arises from the liability of the players to serious accidents. A great proportion of all the accidents at football are owing to the violation of rules on the part of the players. No player can brook the infringement of a rule on the part of another; hence struggling and fighting take place, and injuries result. While football is charged with being the cause of so many accidents that its abolition as a school game has been clamoured for by many, it is well to reflect what other occupation could take its place in a large school during the winter season. My experience of school life extends over a period when football and other games were scarcely played, the boys being left in a great degree to amuse themselves as they listed.

During that time, in the absence of properly regulated games, more severe accidents happened to the boys than I have ever known to take place in the most excited football season that I have ever seen.

It is a matter of notoriety that accidents must happen in a school. When they occur in the course of a game the sufferer has help near at hand, and no distant painful transport, as is needed if the accident happens far from home, which was usually the case in the period when football and other games were not played.

There are of course in every school a number of boys who are unfit to join a football scrimmage; but when these are eliminated, the compulsory system of games is best for the well-being of the boys in a school.

Cricket, fives, hockey, and racquets, are all well calcu-

lated to develop certain of the muscles, and also to educate the senses in quickness of perception and energy of action, requiring much mental exercise. These games are essentially attached to the English system of public-school life. In very striking contrast is the amount of games in a French school. A book of good authority was published in France, entitled "Hygiène Scolaire"; there are minute directions and descriptions of everything relating to school buildings, class rooms, desks, stools, ventilation, and everything relating to the good arrangement of the schools; there are about 250 pages in the book, and of these nine pages only are devoted to "Exercices Physiques." Fencing is the one exercise that supplies a great amount of excellent physical training in France. It is practised in all of the better schools.

One regulation which would press very hardly on our English schoolboy is that the concierge of the school "est défendu de fournir des friandises ou des sucreries," by a circular note of "M. le Directeur de l'enseignement primaire."

While bodily and mental activity are important factors in the development of the young, the periods of rest and refreshment are not of less moment. The sleeping arrangements of a large school require very careful consideration. Ample ventilation both by night and day must be secured. No kind of occupation ought to go on in the dormitories during the day; separate rooms for dressing and bathing after games should be provided. It is a moot question whether large open dormitories or dormitories divided into partial cubicles are best. Nothing can be worse than the shut-in cubicle, where a boy is cut off from all kind of supervision, screened in every way.

The large open dormitory is far preferable to that arrangement. Another plan is to have partial cubicles, that is, spaces separated by partitions that do not rise to any great height, and that do not rest on the floor throughout their length. Such cubicles are open to the whole dormitory, and allow of no excessive or hurtful privacy.

The partitions are useful in case of contagious illness, pre-

venting the infection passing easily from one bed to another. In winter the dormitories should be kept well lighted, till every one is settled in bed and the final visit of the master is made. Early rising is of first importance. A proposal has been made that boys should stay in bed till eight, and have no first school. I am well satisfied that such an alteration of the present system would be fraught with evil, and would be far from assisting the healthy growth of the boys.

Clothing is of great importance in the matter of the health of growing boys, and, above all, the feet should be well protected. I frequently find that great injury has been done in early life by nurses keeping the feet of very young children too long in tight-fitting shoes; if a stout shoe is worn the foot of the child is apt to outgrow the room in the shoe, giving rise to compression and distortion of the foot and toes.

Clothing should be so arranged at to protect the boys from the great alternations of heat and cold to which they are exposed in passing from heated class-rooms into the cold air. Bodily activity supplies a great security against rapid changes of external temperature. There are always in a school a number of half-strong boys who require care and supervision in the matter of their clothing, and who being slow in regard to active exercise, are apt to fill the sick list, especially in the cold and trying weather of winter and spring.

The question of over-work falls naturally under consideration in speaking of the development of the mind. It sometimes happens that a boy of small physical powers, whose constitution is tainted by scrofula or other inherited disease, shows very great powers of mind, carrying off prizes and exciting the admiration of masters and of fellow-pupils; but a time arrives when failure of his powers sets in and he is no longer fit to carry on the work that he had planned for the future. The agile powers of the brain overtaxed, he either dies at an early age or becomes incapable of further exertion, remaining a shattered monument of the evil of over-pressure and over-eagerness in the pursuit

of knowledge. Such boys are found in every school, and it is of the last importance that an early appreciation of their risk should lead to the adoption of measures fitted to arrest the incipient mischief before it is too late.

On the other hand, the risk of malingering on the part of some boys is so great that it is needful to be most careful in any interference with the routine work of the school. It has often struck me with astonishment to look back upon the early days of many men, active, pushing, and successful in the world, who in their young school days were always on the sick list, first with one complaint then with another, until the conviction was pressed home that malingering was at the root of all their complaints.

So far, what has been said has had reference to the circumstances which affect the healthy development of boys in a school. If we wish to ascertain the actual development that takes place at the various ages we must refer to the work of Mr. C. Roberts, who, in his manual of Anthropometry, a work that reflects the greatest credit upon the author, has by a great expense of labour brought together an array of facts that go far to establish a law.

Mr. Roberts shows that the mean growth of a boy of 10 to 11 is 1.50 inches; from 11 to 12, 2 inches; from 12 to 13, 2 inches; from 13 to 14, 2½ inches; from 14 to 15, 2½ inches, from 15 to 16, 3 inches; from 16 to 17, 1½ inches; from 17 to 18, ½ an inch; 18 to 19, ¼ of an inch; 19 to 20, ⅛ of an inch.

The rate of increase of weight is from 10 to 11, 6 lbs.; 11 to 12, 7 lbs.; 12 to 13, 8 lbs.; 13 to 14, 10 lbs.; 14 to 15, 12 lbs.; 15 to 16, 16 lbs.; 16 to 17, 14 lbs.; 17 to 18, 6 lbs.; 18 to 19, 2 lbs.; 19 to 20, 2 lbs.; 20 to 21, 2 lbs.

Chest girth increases from 12 to 13, 1 inch; 13 to 14, 1 inch; 14 to 15 1½ inches; 15 to 16, 2 inches; 16 to 17, 1 inch; 17 to 18, ½ inch; 18 to 19, ½ inch.

These measurements are based upon upwards of 7000 observations. Ten years ago the first measurements of boys took place at Marlborough, at the suggestion of Mr. Francis Galton; since then similar observations have been

made at several other schools and institutions. Many other interesting results have been obtained by these measurements. A short time ago a parent was anxious about his son whose health gave him anxiety, it was however found that the boy had grown and had increased in weight and chest girth in excess of the average of boys of his age, much to the satisfaction of the parent.

I have thus briefly endeavoured to indicate the bearing of the various incidents of school life upon the development of boys. It must ever be remembered that the temperament and habits of boys vary as do the waves of the ocean. It is too much the custom in writing about boys to talk of them as if they were all cast in the same mould, like so many bricks, though a more erroneous way of looking at the life of a public school could scarcely be imagined.

It is needful to give to all boys a proper amount of food, of cubical space, and exercise. These all boys require. But to secure the proper development of body and mind, every boy that comes under observation is in himself more or less of a study requiring a watchfulness that can only be exercised by living amongst the boys and observing them both at work and at play.

This supervision is carried out by House masters and Form masters, who are always ready to confer with the medical officer and to receive his views respecting boys, if they perceive any sign of deviation from health amongst the pupils. The great lesson that I would wish to enforce as my experience of public school life is the practice of *patience.* Many a boy has his career spoiled and great trouble is entailed upon teachers and parents by impatience. Numbers of boys who go to a public school do not settle down well, they possibly look worn and ill, or they may be really ill owing to the great change in their life and other circumstances. The parent is fidgetty and removes the boy; tears up the plant that has not had time to settle its roots.

Another parent trusts, and is patient. The weakly, nervous boy steadily takes root, grows up silently but surely

into a strong, stalwart young man. This has happened in hundreds of instances, and I could point to a vast number of young boys who, coming to us weak and fragile, are now first amongst athletes, travellers, officers, and hard working clergymen, boys who, but for patience on the part of parents and of those to whose care they were confided, would probably have never grown into the men that they now are.

And in thanking you most sincerely for the kind attention with which you have received this Paper, I would wish to leave the word, or rather the virtue, *patience*, impressed upon the minds of all who have to do with schools.

ON THE USE OF GYMNASTICS FOR CHILDREN OF BOTH SEXES.

By R. VON SCHWEIZER,

Director of the German Gymnastic Society.

NORMAL children when born are evenly gifted, that is to say, their mental powers are in harmony with their physical. This harmony does not remain the same in our present state of civilization, the physical development is left far behind, be it in girl or boy. Only compare a child born in town with one from the country. The latter represents personified strength and health, but to a certain degree limited mental power; the boy of the town probably is superior in acuteness, but measure their bodily power, and surely the result will be disadvantageous to the one from the town. The question is, how can this fault be remedied, that the physical power may be preserved to the educated, which is of so great importance, and the answer must be, only by rationally conducted gymnastics. They not only preserve the bodily power, but also give relief from over-exertion arising from mental work, and

further endow the naturally weak child with new strength and health. Consequently, physical education is a threefold blessing: first, it preserves what exists; secondly, it revives lost power; thirdly, it creates missing physical power. Who dares to dispute that gymnastics are a necessity? That physical education has been considered in former times more important than mental culture is shown by the historical records of our ancestors. I will not maintain that we should follow them so far, but we should try to bring mind and body to an even balance. Never will argument be less mighty if backed up by a good biceps.

Having been requested by the Committee to give my opinion on the use of gymnastics for children of both sexes, and being strictly limited to the time of twenty minutes, I find it difficult to do justice to this most important question. That it is just as necessary for the human body as for the human mind to have means to develope its faculties, must strike any observer. The physical education of the human body is in our times a most pressing necessity, in giving health, preserving life, producing confidence, and serving as a preventative against many human ills, it is consequently a necessary art. In all human pursuits progress is only possible when former acquisitions are thoroughly known. We must try to unite the present with the past, and adopt what is useful for our purpose. Truly it was not barren ground our predecessors left us. The Greeks were the first who practised bodily exercises regular and classified. In the course of years they made improvements and added new exercises, yet their system remained to all purposes the same. As Homer shows his heroes engaged in gymnastic exercises, so we find it in the more complete Gymnasia and Palæstræ of Athens, even up to the time of the Roman emperors. That the ancient Greeks recognised the importance of the development of the human body is found in every stage of their history. Lucian (180–160, B.C.) makes Solon speak as follows in his dialogue with Anacharsis the Scythian:

"It is not enough for us to let everybody be as nature made him, but we require gymnastics for all, that what nature has created so happily may become much better, and inferior qualities be ennobled."

The Gymnasia were mostly built near water, for bathing purposes, and a moderate growth of trees for shade was considered necessary. As time went on, with the growing importance of the town and its fortunes, they were beautified and enlarged. Spacious halls with bath-rooms were built, works of art stood in the surrounding gardens, where shadowy walks afforded pleasure and rest to those who frequented the Gymnasia. The race-course (*stadion*) was separate from the Gymnasia. Their gymnastic practice consisted of the following exercises:

Running.—The race-course was about 200 yards in length, the practice divided into two events, with and without armour.

Throwing the Discus.—An iron weight in form of a lentil, weighing from 3 to 4 lbs., was thrown high and far at the same time, but distance was the main object. In later times the discus was made of bronze.

Leaping.—There were different styles of leaping, the long leap was the most practised.

Javelin Throwing was carried on in two different styles, for distance, and to attain a mark.

Wrestling was, according to all evidence, in the "catch-as-catch-can" style.

These five exercises were called the Pentathlon.

To enter more explicitly into the gymnastic exercises of the ancient Greeks is out of question here, only so far as it is connected with the education of their children.

The exercises were carried on publicly in presence of parents and authorities; seats were provided around the ground. The boys were divided into three classes, according to age. Their gymnastic education commenced with the seventh year; at the age of eighteen they entered into the classification of youth.

The Gymnasiarch, or Inspector of Gymnasia, was always

a person of importance. The boys attended the Palæstra, and received their instruction from the gymnastic master (*Paidotribe*). They commenced with games, and were led from easy exercises to the more difficult. The discipline was most severe; they were obliged to be in the Palæstra before sunrise, when they practised running, wrestling, leaping, throwing the discus and javelin, also boxing. Girls also received gymnastic education, but it is not quite clear in what style; yet it is recorded "that a girl at a public exhibition in Sparta jumped up 1000 times in succession, touching her body with the heels."

The Romans practised gymnastics only for military purposes, consequently their system cannot be considered as important for the education of children. In the middle ages, youths were obliged to undergo considerable practice in bodily exercises. It is true the practice was chiefly confined to the higher classes: long and high jumps, clearing obstacles, vaulting on the horse, climbing and practising on slanting ladders, throwing the javelin, and also handling the battle-axe,—these were their daily exercises.

Even Martin Luther understood well the necessity of bodily exercise. These are his words: "Therewith it is also very well bethought and arranged, that young people shall practise something honourable and useful, that they do not fall into debauchery and excesses, neither drink nor gamble, therefore these two pleasures are alike the most, that is to say, music and bodily exercises in fencing, wrestling, running and leaping."

As ladies in all civilized countries are mentioned first, I commence with my ideas of what is necessary for their health and growth. I will not stop to consider whether the parents of the children were healthy or not, nor whether the children have received good food, necessary clothing and habitation, but take it for granted that they all have received such up to the time of their seventh year. The schoolroom they enter at that age is no place for amusement; quietness and attention must be enforced. Boys returning home are allowed to knock about and stretch

their limbs, though not always in the most approved fashion; but girls have seldom this chance, and consequently they require greater attention and care. When girls become older, the school work increases, home lessons curtail their free time. Parents wish their children to enter life accomplished; music, drawing and languages must be studied.

Many hours will generally be occupied by mental work. Is it to be wondered at, that the muscular and nervous systems are enfeebled; that the bony structure becomes impaired, and curvature of the vertebræ is almost the *rule* instead of the exception? Some, like hot-house plants, die when coming in contact with the fresh air of every-day life. Everybody, unless his eyes are purposely shut, must observe this great growing evil. The orthopædic institutes are the places to enquire about the progress of malformation. I will not contend that the gymnasium is a cure for all evil, but "prevention is better than cure."

The exercises for girls must be regulated by other considerations than those of boys, in consequence of the difference of frame. And though the practice of the boys is open to everybody (in fact the public is invited to participate in their festivities), it is different with girls. The curiosity of officious persons must be avoided, not that there is anything to be seen contrary to feminine modesty, yet displays of girls before young men should be avoided. The parents and older relations may be invited to attend. The exercises should be varied as much as possible, to prevent monotony. Youth wants to do something, to achieve something great, and if this is not permitted, dissatisfaction is the consequence, and where the pleasure is gone, the healthy effect required is missed. All practices should commence with extension exercises. Under this schedule may be classed all such instruments as are easy to handle, and may be used on *any* free place. They are dumb-bells, Indian clubs, wands (both wooden and iron), bar bells, hoops, large and small swinging-ropes, jumping-poles, discus-balls, staves, and a rope for pulling,—to take,

say, fifteen minutes; followed by practice on an apparatus, the body either resting on hands and arms, or hanging, taking thirty minutes; then fifteen minutes should be given to jumping, marching, or trotting. The children should feel that they have had some bodily exertion, *but on no account be fatigued.* Half an hour may be given to games, but always under charge of the teacher. *Jumping* is most important for strengthening the whole body, *particularly the lower extremities*, but must be carefully practised, and slowly proceeded with. Beginners must be watched and cautioned, and should any weakness of the back become manifest, the exercise must be at once discontinued. *Trotting* and *marching* have great beneficial influence on the chest, and serve to improve the circulation of the blood. The children should commence with short distances, and gradually increase. To avoid monotony, it may be varied by evolutions. *Balancing on a beam* is very effective, giving surety to the movements of the body, and producing an upright carriage. As with the exercises of the arms, the muscles of the chest and back are brought into action; so these movements acquire double importance, and great attention must be paid here by the teacher, that over-exertion may be avoided. In this category come the exercises with wands (wooden and iron). Bar-bells, Indian clubs, dumb-bells, also horizontal bar and parallel bar. From the numerous exercises on these two instruments only the most simple can be taken into consideration for girls. All those important exercises for chest and back, as "hanging and swinging," "pulling and pushing," should be practised, but always having in mind the difference of the chest, and construction of the body. *Throwing* a ball at a mark may be practised as a game. *Climbing*, in all its changes, is extremely useful for girls; how helpless they are in the moment of danger when ignorant of this exercise. Girls should be taught to swim.

To produce a salutary effect on pupils, all these exercises should be made in company, and three times a week would *not* be too much to obtain a good result. If possible a

gymnastic dress should be used, but high heels and corsets are out of question in a gymnasium. To decide if the instruction of girls in physical education should be carried on by male or female teachers requires further consideration. Gymnastics for boys are required to fit them for the struggle of life and the development of virility. But the practice should be free from all sensational exercises. This opinion finds its justification in the rule that all human development comes by gradual education. The practices should be compulsory from the age of seven to fourteen years, except there should be medical opinion against it. The public examination should be carried on in the same manner as their other school examinations. There should be at least two hours a week in the regular school time allotted to gymnastics. The exercises should be chosen so that they may serve not only for individual benefit, but also as a part of their scholastic training, and should be divided into the following groups:

I. Extension exercises.
II. Tactical exercises.
III. Running.
IV. Jumping.
V. Wrestling.
VI. Apparatus exercises, games, and occasional excursions.

The *extension exercises* should consist of movements of the head, body, arms and legs, and particular reference should be given to the exercises on the apparatus. *Marching* to mark time with either right or left foot, in fact with all possible movements of the legs, all such movements being made by word of command, "uniformity" and "energy" are most important. The *Running* is divided into two parts, against time and for swiftness. The former should be practised with tactical movements, also time to be kept and gradually increased to fifteen minutes, even to an hour, if it is carried out with alternate walking, also clearing obstacles. Jumping is practised either high, long

or deep; also pole-jumping. *Antagonistic exercises* in different styles, as "cock-fighting," "pulling and pushing," even the "catch-as-catch-can" style of wrestling should always be under the direction of the master.

Apparatus practice.—Exercises on the *balancing* beam in different manners of walking, with nearly all leg-exercises taken from the extension movements, "passing each other," and the "fight for position;" also "vaulting."

Climbing poles and ropes; vaulting on back and horse.—The different swing, pull-and-push exercises on horizontal and parallel bars, always taking into consideration the size and age of the pupils. All these exercises should be so arranged by rotation that in a certain time all should come in due order, but to none should more prominence be given than to another. The difficulty that military movements in their strict execution cannot form part of the education of children has already found its solution in those places where they have had a fair trial.

In conclusion I recommend that, to insure uniform success and a sufficient development of physical education, the instruction should be given by the regular schoolmaster, who should undergo a rigorous course of gymnastics in his training college.

"FERIENCOLONIEN," OR HOLIDAY COLONIES.

By Edward F. Willoughby, M.B. (Lond.)

"A day in the country" for the children of the poor whose young lives are passed amid poverty and squalor, in confined courts and grimy streets, is at this time of the year the object of appeals from the pulpits and in the papers to the charitable and benevolent; and one that is generally met by a liberal response.

But intense as is the pleasure experienced by the children as they

> "Riot in the scents of every breeze"—

true though it be, as a poet who above others—loved the country, wrote or sang:

> "Nor rural sights alone, but rural sounds,
> Exhilarate the spirit, and restore
> The tone of languid Nature"—

we often doubt whether the good done is at all proportioned to the cost, or more strictly speaking, whether any lasting benefit is conferred by "a day in the country." To the healthy it is really what it is generally called a "treat," but in the case of the weakly, who most need a change of scene and air, the enjoyment of the moment is, we have often found, more than undone by the effects of excitement and fatigue.

The idea of extending to the children of the very poor the advantages enjoyed by those of the well-to-do, of a sojourn in the country, is not new. It has been carried out to a larger or smaller extent in many places both here and on the Continent, but probably nowhere on the same scale or for so long a time as in Denmark, where for the last thirty or forty years an increasing number of children, no fewer of late than 7000 in a total population of under two millions, are every summer boarded for several weeks, mostly two together, in respectable families in the country. The system has become a part of the national life, railways and steamboats convey the youthful excursionists free of cost, the newspapers insert advertisements and notices gratuitously, and only the humbler of their hosts are willing to accept any remuneration. In Hamburg and Bremen the Danish system has been adopted, coupled with voluntary inspection of the temporary domiciles of the children, of whom several hundreds are now thus boarded out. But praiseworthy and deserving of imitation as this practice may be, it is not that which it is my intention to introduce

to your notice, but one of a far more complete and methodical character.

Holiday Colonies owe their origin to the exertions of Pastor Biron, of Zurich, who sent out the first in 1876. Other Swiss towns followed the example of Zurich. In 1878 Basel, in 1879 Aarau and Bern, in 1880 Geneva, and in 1881 Neufchatel and Winterthur. Germany could not long lag behind. In 1878 the veteran hygienist and philanthropist Dr. Varrentrapp began with colonies for ninety-seven boys, and next year for eighty-five boys and forty-eight girls, the number increasing every year, until in 1883 no fewer than 174 children enjoyed for a whole month the romantic scenery and invigorating air of the Odenwald, Vogelsberg and Taunus mountains.

In 1879, Dresden, Stuttgart, and Vienna; in 1880, Bremen, Cologne and Leipzig; in 1881, Breslau, Chemnitz, Düsseldorf, Elberfeld, Hanover, Kiel, Karlsruhe, Königsberg, Lubeck, Magdeburg, Nürnberg, and Posen, and more recently other towns too numerous to mention, have followed the example set by the historic city of Frankfort. In 1881 Milan; and either then or in 1882 Warsaw; and in 1883 Paris tried it on a smaller scale.

The advantages justly claimed for the holiday colony over the boarding out system are that, while in the latter the children enjoy the benefits of country air, there is no guarantee that they are especially cared for, that their diet is much better than at home, or that they are brought under any refining and elevating influences, moral or intellectual.

With the holiday colony all is different, but I cannot show this better than by at once proceeding to describe the method pursued.

A permanent committee is formed, composed of clergymen, medical men, members of the town council, and ladies and gentlemen interested in the welfare of the poor, by whom funds are collected during the winter and spring. As the time draws near, the head teachers of the primary schools are requested to send in lists of such children as they think

most deserving and likely to receive benefit from the change. Of course, they must be really poor, feeble or weakly, but not actually ill, not over fourteen years of age nor under seven or eight, since these last would require too much individual attention. They are then subjected to a strict medical examination, and such a number as the funds in hand permit of are finally selected

Sometimes large colonies of thirty to forty children are formed, under the care of two or three teachers ; but, as a rule, smaller parties of ten to fifteen are preferred, under single teachers, since such are more likely to give their undivided attention to the children entrusted to them.

The choice of localities engages the attention of the committee some time before, though the same houses are generally engaged year after year. Usually a farm-house, school, or more rarely an inn, is selected, of which the sanitary surroundings are good, and where there is at least one large room, large enough for indoor games and entertainments. The spot must be open and healthy, mountain or moorland where possible, that the children may roam at large in the forest or heather. Far enough from home to be beyond the reach of their parents, but not so distant as to render the transport needlessly expensive, and on no account in the routes frequented by tourists. Facilities for obtaining fresh meat, bread, vegetables, and milk, must also be taken into account, other food, as butter, rice, macaroni, &c., being brought from the town.

On the judicious selection of teachers much of the success of the colonies depends. They must be cheerful, genial, sympathetic, and able to enter into the games and romps of children with something of the exuberant buoyancy of spirits characteristic of childhood. Especially in the case of male leaders is it desirable that they should be good swimmers and fair athletes generally. Musical ability is an almost essential qualification, and an acquaintance with natural history is no small recommendation. In some places a married man attended by his wife is supposed to give a home or family character to the colony, but in

Frankfort single teachers whether male or female are found to identify themselves more completely with the pursuits of the children in their charge.

I have said that actual disease disqualifies children from admission; it is particularly so with epilepsy, affections of the eyes rendering them intolerant of a full light, or skin diseases requiring local treatment; but slight degrees of scrofula, &c., do not, and are greatly benefited. It is found an advantage to mix in one colony children of different ages, especially among girls, the elder ones looking after the younger, as well as doing all the lighter necessary domestic work of the establishment, as sweeping the rooms and bed-making, which is required of boys and girls alike, but a regular cook is of course attached to each colony.

The outfit of the children is often a matter of much difficulty. Decent clothing, change of linen, and stout boots, are insisted on; and the lady members of the committee see to its provision by all parents who can reasonably be expected to afford it: where these are really too poor it is supplied out of the general fund. At the same time great care is required to prevent parents taking advantage of this relief, and neglecting their duty in the expectation of charitable assistance at the last.

With few exceptions the time passed in the country is one month, corresponding with the summer holidays. All book studies are banished, and every hour of fine weather is spent in the open air, in rambles through the forest or on the heaths and moors, in long walks, varied by excursions in vans to places of interest or visits to other colonies, the boys and girls exchanging courtesies. And once or more the committee visit the colonies with treats of fruit, or the children are invited to the parks or gardens of the country gentry.

The boys are accustomed to bathing in the open air, and many who at first shivered at the sight of water become good swimmers before the end of the month. Running, jumping, climbing, and such like exercises are encouraged, the teacher, or director as he is called—for all that could remind them of school is avoided—leading the sport.

In wet weather, when they are confined within doors, the time is spent in singing, occasionally with musical accompaniments, in writing letters to their parents, and in indoor games and amusements, or the director explains the processes of some industry or manufactory they may have seen in their walks.

In every colony are some children with more or less taste for natural history; these are encouraged to make collections of plants or insects which they arrange when in doors, the director taking the opportunity of drawing out their powers of observation, and explaining the life-history and habits of animals.

Other boys, who exhibit a turn for drawing, are allowed to try their hands at sketching, and I read in the last report of the Frankfort Society that some really creditable maps of the district were made by the boys from their own observations; an accomplishment which these youngsters may some day turn to practical account as Uhlans in an enemy's country.

That these children, living in the open air, on a liberal diet, gain in weight and improve in health, is no more than might be expected, but it is most important to observe that the benefit received is found to be permanent; measurements and weighings, repeated every three months, show that even when they have returned to their homes, sometimes amid most unfavourable sanitary surroundings and with meagre diet, they continue to gain in height and weight above others who have not enjoyed the same advantages.

Any cases of slight illness, as diarrhœa or colds, are treated gratuitously by the medical men in the neighbourhood; a few ordinary drugs being supplied by the Committee. Now and then a child has been sent home, but considering the great change in their mode of life, and the inevitable exposure to wet, &c., the amount of illness is perfectly insignificant, and after the first fortnight the most delicate become comparatively hardy.

But the moral improvement is not less than the bodily;

habits of cleanliness, order and civility are inculcated and rapidly acquired, their intellects are drawn out not by book study, but by the association with the director on a footing quite different from that enjoyed before, and the suppression of evil example with the separation from the counteracting influences of life in the slums.

Indeed the teachers find that the colonists as a rule make better progress in school work in the year following, than they had previously, or than other children similarly circumstanced in other respects.

As to the cost—It is not easy to guess what this would be here, but in Germany it is remarkably uniform. Including the honorarium of from £5 to £10 paid to the director of each colony, it is about two shillings per head per day, and this whether the colony be large or small, and from Dantzic to Milan. In England it would probably be somewhat more. We have, unfortunately, it may be said on many grounds, less forest land than there is in Germany, and consequently localities at greater distances would often have to be selected.

But the question is whether the money would not be better and more profitably laid out in securing positive and palpable benefits for a selected few, than in the equivocal advantage of giving a large number one day's enjoyment followed by reaction and fatigue.

DISCUSSION.

Dr. ROTH said he was sure he expressed the general feeling of the meeting in saying how much indebted they were to the authors of all these Papers. With regard to the question of clothing in schools, which Dr. Fergus had referred to, he would suggest the desirability, especially in boys' schools, that no braces should be used; the same applied also to women's dress, everything which hung

from the shoulder interfered with free movements, and therefore it would be a great advantage not to use braces, not even those which were supposed to be the most perfect. With regard to the last paper, he was only sorry the author did not send a subscription-list round, so as to at once bring it to a practical point. If a month's holiday did so much good he would point out how much good might be expected to arise from the system which had been advocated for so many years by the Chairman, under which each child would have half a day's holiday every day. It was proved by Parliamentary and other reports that children under the half-time system learnt as much as those who were at school the whole day, and this showed that if the mind were permitted to have rest it could receive instruction much more readily. Coming to his own task, that of gymnastics, he could not admit with Mr. Schweizer, that all children at the age of seven had what he said, good clothing and sufficient to eat. He would also point out that in Germany only a certain class were permitted to make use of these colonies, because the medical inspection of schools was attended to. At Brussels the school children who were ill were taken care of, and there was no doubt that good medical treatment would save a great deal in poor-rates; but at present in England the idea seemed to be to at first get the evil developed, and then to cure it, and he was very sorry that the question of the medical inspection of schools had not been included in the subjects to be discussed at the Conference, for that was the only way to prevent chest complaints, and many others, which were so common. Amongst the very poor the parents could not provide medical attendance, and therefore the community should do it; and if they had not enough to eat, they should have a piece of bread every day, or a little milk. In Brussels there were two medicaments especially used, cod-liver oil for children of strumous and scrofulous habit, and another called quotonic (?) powder, which contained all the salts necessary to be found in the blood. At the end of each year the children were taken

before the burgomaster to show the result. He could not sufficiently impress on the attention of parents the importance of insisting that wherever there was a school there should be medical inspection. Gymnastics, though very important, formed only one part of physical education. Mr. Schweizer had pointed out that every schoolmaster should be taught, and so he should, but there was not one training-college in England in which physical education formed the subject of instruction, and as long as this was the case, how could you expect to have teachers who could teach physical education?—it should form part of the study of every teacher, and every medical man. He was opposed to the system of introducing gymnastic apparatus in a school. The object of physical education was to harmoniously develop the different parts of the body, and preserve the balance between the body and mind, and in order to do this it was not necessary to have apparatus. The example of the Greeks had been referred to, but they did not have gymnastic apparatus; they did not have ropes and parallel bars; it was all done by dancing, marching, and other exercises of so-called aesthetic movements. It was very well to talk to rich people and large public schools about apparatus, but when you came to the 300,000 in the London Board Schools, you could not provide even simple appliances for them, except at a very great expense, and people were already complaining of the outlay for schools. In Ling's Swedish system the exercises were based on anatomical, physiological and hygienic principles. The aim of gymnastics was not to see what was possible to do with the body, but to properly develop it. When you knew the alphabet you could use the letters to write nonsense, but the proper use was to write good sense; and so with the body you might do just as much nonsense as you could write with the pen, but it was desirable only to do in schools those exercises which promoted an equal harmonious development in all parts of the body. There was an attempt being made in the London School Board to introduce a modern gymnasium,

but they had not even teachers, and without them you could not teach. For the last sixty years there had been established in Stockholm a special institution for the instruction of teachers in physical education and gymnastics; they were admitted only after having received the certificate of a teacher, either male or female, and then they went through a course of two years, and they had to pass in anatomy, physiology and hygiene, and to attend to the dissecting-room, so that they might thoroughly understand the human frame. The same thing was done in Prussia and several German colleges, but nothing of the kind was known in England. His aim was to encourage and bring forward the necessity of having a similar institution here. Athletics were very fashionable. But games must not be confounded with physical education. It was very well to have all possible games, but physical education was a science which must be learnt just like reading and writing, and there should be a time specially appointed in the time-table when nothing else should be done. A gymnastic movement was similar to a sound in music, which must be in a certain key, it must be done in a certain time, and there must be a certain series.

Mr. JOHN HOLM, F.R.C.S.E., said the subject treated of in Mr. Schweizer's Paper was one to which he had given some considerable attention, not only from a medical point of view, but he had had the great privilege of having been assistant for some twelve years of the late Professor Georgi, one of the two pupils of Ling, to whom the Swedish Government entrusted the control of the central establishment in Stockholm. The main thing which it appeared to him important to consider was, the object of gymnastic or other physical education. It should be to develop the body in perfect harmony, not to over-develop it, which was quite as possible as to over-develop the mind, and to neglect the body altogether, and either one or the other would result in evil to the individual. Now, unhappily, in many systems of gymnastics that great object had been overlooked; the object had been too much to perform this,

that, or the other feat, and the result was unequal development. To take an instance of a young man, the typical ploughman, who as a human being was a most clumsy creature, but there was no reason why he should be such. With a proper system of physical education he should be as good a man as any soldier in his deportment, carriage, and powers of work, and he would be all the better ploughman for it. There was no doubt that deficiency of bodily health must react injuriously on the brain. A very ordinary failing in gymnastics was paying too much attention to the arms, and too little to the legs and other parts of the body, except in jumping; but that was a fault which Ling's system entirely obviated. Dr. Roth had rather condemned the use of apparatus, and he went with him to this extent, that apparatus was no essential part of a good system, but it was in the highest degree desirable as an aid; for, though you could develop the body without apparatus, you could do it much better with, and in Sweden the authorities of the Central Institute were so convinced of this that they had only recently been at an expense of £3500 in fitting up a gymnastic apparatus in the Catarina School at Stockholm. The curriculum of teachers at the Central Institute, to which Dr. Roth had referred, had been extended from two years to three, because it was found that the requisite efficiency was not always attained in two years. Recreative exercises were in the highest degree good, and the good average physique of which English people boasted was undoubtedly due to their sports at schools; but unfortunately girls did not participate in those sports as well as boys. It was quite as necessary that women should be strong as well as men. Half the causes of misery in married life was because the women were weak and miserable. But recreation took the place of fiction in literature. You could not train the mind for working purposes on a diet of novel-reading, neither could you train the body perfectly on a diet of sports, and there was one fault about them, that nearly all our games were right-handed, and therefore developed the body unequally.

Mr. E. NOBLE SMITH said he feared the discussion had a little gone out of the practical line which it was desirable to take. Most of the persons came there to learn how these points, which had been more or less settled already, were to be applied to schools at the present day. With a view to confining his remarks to a practical point, he would first read some suggestions which had been handed him in writing by Mrs. William White; children from three to ten years of age ought not to sit still for more than twenty minutes or half an hour at a time, and whilst sitting they ought to have a stool or bench under their feet—the dangling of children's legs at any time is highly injurious—the chair-back ought to be high enough to form a rest or support for the head. At the end of twenty minutes' lesson, children ought to play a game under the direction or supervision of a teacher, either indoors, or out-of-doors, according to the weather. Games could be made instructive, even scientific, notably the games used in Germany, and the children should be taught to sing whilst playing. Finger, wrist, arm, leg, and trunk exercises, without apparatus, are admirable, and conduce to the flexibility and general health of the whole body. Games with balls, light dumb-bells, and wands, when properly directed, brought into play every muscle of the body, and so strengthened all its parts. No game should exceed fifteen minutes. Children should be encouraged to garden, and in this way, learn the rudiments of botany. Object lessons should enter largely into the education of children under twelve. Many a boy who could work a problem in Euclid could not tell the properties of tea, cocoa, sugar, &c., or where these daily articles of food grow, or how cultivated and prepared for use. Object drawing, too, amuses and instructs; it gives an accurate idea of form and colour. Boys might learn to knit, net, and sew as girls do. Many a man at sea, or in the bush, would bless the mother who had taught him how to use a needle in his childhood. If boys and girls were educated together, as is often the case in home teaching, up to twelve years of age, he believed

both would benefit, and boys would assuredly be more respectful and more considerate to girls than they now are. He was quite sure that girls who play cricket, rounders, tennis, and even football under supervision, were certain to be not only well-formed, healthy women, but in the truest sense self-respecting and womanly. He could not help referring to the subject of yesterday's paper when this question of recreation was touched upon, and some most excellent practical remarks were made by Miss Lupton, of Bradford, tending to show that the children in those schools were practically without any exercise whatever. Much had been said about football, which was a most excellent national game, but he thought cricket had been scarcely sufficiently praised, for he looked upon it as of all games an English game which had more tendency to develop the body naturally than any systematic gymnastic exercise. Mr. Schweizer's paper was very interesting, and contained a number of valuable facts, but when he asked who dared to dispute that gymnastics were a necessity, he said he did not hesitate to say that such gymnastics as were there referred to, such exercises as marching for an hour at a time, and under the supervision of a teacher, was not a necessity. He would rather see more natural exercise. If Solon said it was not enough to let everybody be as Nature made him, he was of opinion they were bound to follow Nature's dictates. Nature pointed out that children required not only exercise, but recreation of the freest kind. He would take the verdict of any school whether they would go and do a day's work in the gymnasium or go and play cricket. But it was not only a question of theory; to show how it worked in practice, he would read a letter which he had received from a lady at the head of a large establishment at Ealing, which had already been referred to in the course of the Conference, where those exercises had been introduced amongst the girls. She said: "In a school you mentioned exercises of all kinds have been tried for two years, that is, exercises under this special system, for twenty or thirty

minutes per day, with very little result in deportment as compared with the games which have been in vogue for but six months. Our girls have improved in every way since the games were adopted, and are as enthusiastic as the boys, whilst the exercises are thought—although very graceful and interesting in themselves—listless and without energy, except when the superintendent rouses them to really good lively drill." That was a practical result, and, therefore, while he did not condemn gymnastics, he would say let them be employed in wet weather, but not to the exclusion of games. Then it was said that the exercising of girls before young men was to be avoided. What was there unseemly or wrong in their exercises? why should not a girls' school play cricket before anybody? They ought to get rid of that false modesty and false idea that there was something wrong or indelicate in a girl exercising her body in the freest manner. He thought the old motto, *Honi soit qui mal y pense*, applied especially to such a case as this.

Mr. SCHWEIZER said he thanked Dr. Roth for the opportunity he had given him of saying that he had sent his sons to be taught gymnastics on the German system. He was sorry to a certain extent that the question of Swedish gymnastics against German had been mooted, for he never had an idea that such a thing would happen; and as he happened to be an honorary member of the Swedish Gymnastic Institution of Stockholm, he did not like to enter into the question, but, as the German system had been to a certain degree attacked, he was compelled to answer. With the exception of the duplicate and so-called "movements of resistance," every exercise had been made long before Mr. Ling was thought of, and even now a great deal was taken from the German system, which only proved how difficult it was to make good better. He did not think there was any physical system more fit to develop the whole powers of a man than the ancient Greek system; but it must be remembered that the theory of Mr. Darwin with regard to the survival of the fittest was carried out to such an

extent in those days that the weak and sickly children never came to maturity. There was an anecdote of an English king who had a favourite who professed to be very fond of partridges. He had him locked up in a tower and served with partridges for breakfast, partridges for dinner, and partridges for supper, until at last the favourite wished that some one who could not be mentioned in polite society would fly away with the partridges; and so it seemed to him they had the Swedish partridge for breakfast, the Swedish partridge for dinner, and the Swedish partridge for supper, until people would be inclined to call on the gentleman to fly away with the Swedish partridge. Every system was good if it were carried out well and faithfully, but if he were going anywhere he should not go by the circumference of a circle, but by the radius; and the German system was decidedly the quicker way to get an entire development of the body. He would not exclude games at all; on the contrary, he liked games, and within four years, and he was now sixty-four, he had played football himself, but he claimed one thing for gymnastics which no games attained, for they only made people half men. Homer said in one of his songs, when Achilles after the death of Patrocles was ravaging the Trojans, he met Pisistratus; and then, according to Homer, he threw two javelins at the same time, because, to use his expression, he was with his left hand right. That was the great advantage of gymnastics, it made a man use both sides the same. It had been said that a prophet had no honour in his own country; but on the Continent Holland adopted the German system, and so did Belgium, where the German Gymnastic Society carried away the gold medal at the festival two years ago. Italy, Switzerland, and even France adopted the German system, and he was sure if Frenchmen could find anything better they would take it. He was not given to prophesying, but if any one could tell him where last year's snow was he would tell him where ten years hence the Swedish system of gymnastics would be.

Miss TUBBS (Hastings) said it had been stated that the

work of physical education was the harmonious development of the whole of the human body, but she did not think the advocates of either the Swedish or other gymnastics had covered the ground entirely, and wished to add one particular item from Italy and Germany combined. She wanted to see added to physical education that very important part, the culture of the human voice divine. Many people thought that if you could sing you could sing at once; but there were voices and voices. Probably both boys and girls could be taught to do gymnastics, but very few could be taught to do it at once; and in the same way voices required development, like any other part of the body, and it was not merely a fancy as regards art which made her press this, but that it should be developed as a means of physical good. She had been much struck by noticing boys doing gymnastic exercises merely at the word of command, and it occurred to her how much better they would have performed them if they could have been done to longer or shorter sounds of music. She would leave it to medical men and physiologists to explain the subtle harmony which existed between every part of the body—in the measurement of the eye, and the ear, and the muscles; but it would be found that, given a human body of normal health, the physical power of the voice would correspond to the physical power of the body. She wanted to see the development of the human voice and of music carried out in all schools. Of course it was well understood that it was not until the voice was fully developed, and the individual, either male or female, fully grown, that the voice-trainer could be brought to take his full position; but still the voice could be developed in a smaller and gentler way from childhood, and the child should be taught, as the late Mr. Hullah said, from the fourth year, and if from their earliest years children were trained as in the Kindergarten system, and that training, as it should be, were carried on through life, they could not fail to be healthy and beautiful. Some years ago she read in a journal on education that in some schools in America the gymnastic exercises

were performed to music. The article did not go into detail, and specify whether the pupils sang or performed on instruments; and though she was quite in favour of encouraging instrumental music, still the human voice was the natural instrument for the development of the voice and cultivating the eye to recognise sound as well as the ear; the faculty of rhythm and harmony might all be taught simply by using the voice. She alluded to this more especially because all elementary schools might do so much towards elevating and refining the physical powers of teaching, and they could not afford to teach them instruments. A few exercises, of course, could be carried on while the child was singing, but the school or class could be divided into two divisions, one performing exercises whilst the other was singing. This would ensure attention to time and music very much better than by any abstract method. Those who were doing physical exercises would have to keep time to the music, and would gain precision, whilst the musicians, on the other hand, would have their faculties of attention quickened, because they would know that if they failed in time, either by breathing too quickly or too slowly, they would mar the harmony of the physical exercise. She had not heard this idea propagated in England, but she thought it would be the physical and artistic education of the future. She had it on the authority of professional singers that the actual exercise of the voice was conducive to the growth and development of the body; and she knew young girls of seventeen and eighteen, rather narrow-chested, who had developed into wide-chested, healthy girls, solely from having good singing lessons. A lady who had devoted many years to studying under the greatest singing-master, Garcia, told her that it strengthened the muscles of the back, and it could be no useless exercise which did that. If vocal exercises and singing enlarged the chest and strengthened the back it had most important physical results beyond the artistic faculty, which was also raised and developed. You had in music what she would call the bridge between the purely

physical and mental, and intellectual and emotional, and therefore the proper study of music was the most refining and valuable agent which could be introduced into schools of every class. She had sometimes been thought rather visionary for advocating these rules, but had been much gratified to find that Sir George Grove, the head of the National Training School, entered into her ideas very warmly, and told her she must have been reading up Greek methods. She did not claim to have much knowledge of them but she certainly thought they should be adopted naturally into our modern ways.

Mr. JABEZ HOGG said the method just described was carried into effect at the Royal Masonic School at Battersea with very great efficiency and benefit to the 230 girls who were educated there. All the gymnastic and calisthenic exercises were accompanied by music.

The CHAIRMAN said from long experience of the district schools he could say that in former times not one in three who left Paris schools turned out well, the great mass went out as vagrants, and returned as paupers; but now in district schools, where they had various exercises and military drill, were taught to climb a mast, and swimming, besides being instructed in handicrafts, the general result was that fully 90 per cent. turned out well. The head teacher of one of those schools, however, agreed with him that great advances yet remained to be made, and one thing he recommended was that the system practised in Sweden should be adopted on which every child on admission was diagnosed as to his physical defects, and a prescription was written out directing what physical exercises calculated to remove that defect, should be employed beyond the general exercise. Thus a girl with a flat chest would have an extra dose of those exercises calculated to open the chest. There was an immense mass of preventable illness amongst the whole population. It was found that 3 per cent. of recruits were rejected on account of defects of which they were unaware. Again, the class of insane in all institutions were found to be of low physique, and it was stated that

early physical training would correct a vast deal of that. It was equally matter of observation by the officers attending prisons that a large proportion of the criminal classes were of low physique, and that this low physique might be corrected by physical training. Again, there were 30,000 blind in the kingdom, a great many of whom might have had their sight preserved by early attention. One thing which ought to be done was to establish colleges of physical training, one for men and one for women, commensurate with mental training. There was no doubt that a conjunction of singing with physical exercises was attended with great advantage, as had been found in America, and he was sorry the Educational Department had not introduced the same system here. One could not discriminate all the elements of sanitation which had gone to the result, but there was no doubt that the children of the lowest type in the metropolis, when they came into the district school, and were well fed, and their physical development attended to, had only a death-rate of three per thousand, eliminating those who came in with developed disease, whereas in the general population it was more than double that. The headmaster at the schools at Feltham told him that the children who came to him, whose hands were untrained to anything but picking and stealing, after they had gone through a physical and industrial exercise and drill, now got into good places when they left the school to the extent of 85 per cent. or 90 per cent., and in these half-time schools the education was fully up to that in the long-time schools.

Sir JAMES PAGET said he must in the first place apologise for not having been there earlier, but by some misunderstanding as to the time at which the meeting was to be held he was unable to be present to take the chair, and would therefore assume the more pleasant duty of asking the meeting to thank the Chairman who had taken his place for the very able manner in which he had conducted the business, and for the very instructive words he had uttered. He confessed there had been a serious loss to the interest of the Conference in the absence of two

gentlemen who had been expected to attend, who would have maintained the value of the English system of gymnastics in competition with the Swedish, German, or Italian The Head-master of Eton and Mr. E. Lyttelton were leading English teachers of gymnastics, and he had no doubt that the Head-master of Eton, though he would now have to devote more time to other subjects in the higher classes of that great school, would still give a great deal of attention to the system of English gymnastics, and would still maintain that it was superior to either the German or Swedish, as he was himself resolved always to maintain. German, Swedish and other gymnastics were admirable things for those who must be confined for the most part in houses or schools, and who had not a great store of national games to which they could use themselves, with all the advantages of muscular exercise, and, as he maintained, with other advantages superadded. With regard to scientific gymnastics as compared with cricket or football, he should like to see it tested with a large number of persons, but he should be inclined to back any hundred or thousand well-educated, well-bred, well-fed Englishmen against any thousand Swedes, Germans, Frenchmen, or Italians, and that not only for the widest possible range of muscular exercise, but for enterprise in climates, places, and difficulties of all kinds. This was what was gained in the English gymnastic exercise in addition to what was to be obtained by simple muscular exercise. He held that the moral influence of English games was a thing to be esteemed even above their muscular influence Our English boys were left to self-guidance, and developed self-government, mutual control, absolute command of temper, and absolute honesty in all their games. He considered it a dire sight to see boys out for what should be pleasure under the guidance of this person or that, directing how they were to do it or how they were to behave in the doing of it. He had heard many things traced from their origin in gymnastic education, and he would ask whether there was any country in which the most vigorous opponents, of whatever school

of thought—whether in theology, politics, morals, anything you pleased—included a larger number of personal friends who were ready to engage in all the most harmonious pursuits of life, except upon the one point they differed in. He maintained that that came from nothing so much as it did from that habit of boys beginning from their earliest days to enter into the sharpest competition, a competition which might bring the most bitter hatred, but in which they were bound to keep their tempers, or they would be laughed at if they lost them. Again, looking at the standard of honesty, which was kept up in all these games with mutual competition. There were things which were allowed in what was called commerce, which were at least very questionable, very sharp bargains, if they were not a little dishonest; and the same man who would be a little dishonest in his trade pursuits would be called a vile blackguard if he were dishonest in a game. The standard of honesty in games was higher than in any branches of English life. He should look therefore with the direst regret on any displacement of any one of our English muscular competitive athletic games by the introduction of any system of scientific gymnastics whatever. He could not deny that scientific gymnastics might have a certain place for certain persons with feeble muscular frame or feeble health, or for those who were absolutely excluded by circumstances from athletic games in the open fields; but as he passed through the counties of England he saw one thing with more satisfaction than another: it was the incessantly increasing growth and practice of English games in every village. There was not a village in the country now that did not produce cricketers and football players; not a country town or village which had not its field in which every man could have his game after the day's work was over; and it was the most admirable part of the English social system that not only among the richer classes, but the poor, this was perpetually increasing. There must be an exception or two in which he must admit, in the present state of things, which would not be

permanent, gymnastics of a scientific kind must come in. There was no opportunity of having sufficiently large playgrounds for the Board Schools in London, and if they could not have those let them have gymnastics; but the strife of all Englishmen should be to provide that the poor children should have the same privileges as the rich, to have their regular playgrounds in the open air, and their games with mutual self-control, and without supervision, their trials of temper, and their good-natured competition. Let that, not the most perfect system of gymnastics, be the object for which Englishmen should strive—that the poor should be like the rich in all those outdoor advantages, and in their free opportunity of healthful games. One word more with reference to girls. It was quite true that they could not all have the same kind of muscular games as men, but happily these athletic games for girls were increasing very rapidly. They heard constantly of women invading the rights of men, and that they wished to be as free as men in everything. If so, then let them be also as men in this respect; if they would have the higher training let them also have the happier method of idleness. They worked far too hard—far harder than men. Let the mothers of the present generation insist for their daughters that if there was to be work there should also be play, and let there be time set apart for that play, so that it should be as much like men's play as anything could be. We should have to except, perhaps, football at present, but short of football he he knew no game played by men that should not readily be played by women, added to others of their own which men could hardly share in. He quite agreed in the necessity that women should be as strong, and muscular, and healthy as men, and they could only attain this by exercise. It was at least as important to the next generation that the mothers of to-day should be muscular as that the men should be. There were more ladies present than men, and he would ask them to strive for this. Men had learnt far better to work in mutual help even when they were opposed than women had. Let them learn in their games to be

gentle—that they always would be—but let them also be straight, fair, and thoroughly ready to reconcile themselves with all the other ladies with whom they might differ even on some very important points. He had also tried to say in a few very imperfect words what would have been much better said by the Head-master of Eton, or Mr. Lyttelton; but he would venture to say in conclusion that if the Germans, Swedes, or any others would adopt the English system of gymnastics, they would find themselves vastly better for it.

Conference on Saturday, Aug. 2, 1884.

This Conference resumed its sitting on August 2nd, Dr. Langdon Down in the chair.

SUBJECTS FOR DISCUSSION :—

15. "*The Health and Physical Development of Idiots as Compared with Mentally Sound Children of the Same Age.*" By G. E. Shuttleworth, B.A., M.D., &c.
16. "*Facts concerning Idiocy and Imbecility.*" By Fletcher Beach, M.B., M.R.C.P.

The Chairman said the subject for discussion was special institutions for the education of idiots and imbecile children, foundlings and orphans, rickety and scrofulous children. It was a very remarkable thing that institutions for the education of those who could not take care of themselves had in the present generation engaged so much philanthropic attention. About forty years ago no one ever heard of educating those who were feeble-minded, or taking care of those who were weak in body, but now in various parts of the kingdom there were institutions for this purpose. The first effort to educate feeble-minded children must be attributed to a small institution which now existed in Bath, and subsequently a most philanthropic lady, Mrs. Plumb, assisted by Dr. Andrew Reed, established an asylum at Highgate, and afterwards at Colchester, these two being amalgamated in 1858 into the present Earlswood Asylum. Since then the Metropolitan Asylums Board had taken up the subject, and were represented by Dr. Fletcher Beach, who would read a paper upon it.

THE HEALTH AND PHYSICAL DEVELOPMENT OF IDIOTS AS COMPARED WITH MENTALLY SOUND CHILDREN OF THE SAME AGE.

By G. E. SHUTTLEWORTH, B.A., M.D., &c.,

Medical Superintendent of the Royal Albert Asylum for Idiots and Imbeciles of the Northern Counties, Lancaster.

IN honouring me with an invitation to introduce to this Conference some subject connected with "Special Institutions for the Education of Idiots and Imbecile Children," your Secretary suggested that the discussion of the health, development and mortality of this class, as compared with ordinary children, might be of interest. I have, therefore, endeavoured to cull from the Reports of the larger English institutions such information on these points as may serve more particularly to elucidate the hygienic conditions and necessities of their special work.

To this audience I presume I need not insist upon the constant co-existence of physical and of mental defect in the case of idiots and imbeciles. Idiocy may indeed be truly described as a "vice of the entire organism," an affection, therefore, not merely of the nervous system, but of the functions generally of organic life. Oftentimes the whole bodily conformation bears the impress of idiocy, and not only the lineaments of that face, which by its intelligence should reflect the Divine image, but even the form of the limbs, and especially of that masterpiece of mechanism the human hand, are sadly marred. It may indeed be asserted, that in certain typical cases of idiocy an expert can approximately gauge the mental characteristics by a careful survey of the hand, or by a glance at the tongue alone! I refer especially to a re-

markable and not uncommon type of idiocy, in which specific physical peculiarities are found pretty constantly associated with certain definite mental conditions; this type has been designated from its physiognomical resemblances the *Mongol* or *Kalmuc* variety. In another well-marked class of cases, a peculiar dwarfishness of body with certain features of Cretinism, co-exists with a quite characteristic sluggishness of thought and action; and the mutual likeness of members of this group— called "sporadic cretins"—is indeed marvellous. Other striking defects of physical development often arrest the attention of visitors to idiot asylums: on the one hand will be seen patients with abnormally small heads (*microcephalic*), in aspect almost bird-like; and on the other, individuals who look "top-heavy," with heads distended by hydrocephalus. As old Fuller quaintly puts it in his 'Dissertation on Natural Fools,' "heads are sometimes so little that there is no room for wit, and sometimes so long, that there is no wit for so much room!"

These introductory observations will prepare us to find that, as regards physical health and development, the idiot labours under serious disabilities as compared with the mentally-sound child. And on the principle of the "survival of the fittest," and remembering that imperfectly-formed tissues are not likely to wear well, it may reasonably be surmised that the mortality of idiot children will prove exceptionally heavy.

If I were asked what is the most constant and characteristic defect of health amongst idiots, I should unhesitatingly reply in the single word *scrofula*. This is not the place to discuss how much that word includes; but we may go so far as to say that its most common manifestations are glandular swellings and abscesses, and that the defective vitality which accompanies it interferes with nutrition and development, and renders its victim specially obnoxious to injurious external influences. The inmates of an idiot asylum furnish frequent examples of glandular sores and scars, of inflamed eyelids, of discharging ears,

and of peculiar eruptions upon the skin. The late Dr. Howe, who investigated the histories of 574 idiotic persons in the State of Massachusetts, says that no less than 419 were known to be of decidedly scrofulous families.* Dr. Ireland is of opinion that "perhaps two-thirds, or even more, of all idiots are of the scrofulous constitution." † At least 75 per cent. of the deaths in the Royal Albert Asylum are attributed to diseases of scrofulous or tubercular character, and a similar proportion seems to obtain in other institutions for idiots.

In a Conference held under the auspices of the Health Exhibition, it is, I presume, intended that lessons should be deduced from the subjects discussed as to the avoidance and prevention of disease. I cannot therefore leave the subject of scrofula in connection with idiocy without remarking that it is essentially a disease of darkness and dirt; and just in proportion as our people learn to esteem light and cleanliness, both of air and surroundings, and to adopt temperance in all things, we may look for a diminution of this evil. The avoidance of imprudent marriages of persons strongly predisposed to scrofula, is a lesson which sanitary reformers cannot too strongly enforce.

There is another large section of idiots whose physical infirmities bear the strong impress of nervous disorder: I allude to the epileptic, choreic, and paralytic classes. Dr. Langdon Down mentions that in 2000 cases of idiocy investigated by him, well-marked neuroses (nervous disorders) existed in 45 per cent. of the family histories.‡ The most frequent and formidable of the nervous disorders connected with idiocy is undoubtedly *epilepsy*. The frequency with which it complicates idiocy may be gathered from the facts that in the last published § Report of the Darenth Schools for Imbecile Children, Dr. Fletcher Beach states that 153 out of 496 patients suffer from epilepsy;

* Dr. S. G. Howe, 'Causes of Idiocy,' p. 57.

† Dr. W. W. Ireland, 'On Idiocy and Imbecility,' p. 24.

‡ 'Brit. Med. Journal,' Oct. 11, 1873.

§ Report for 1882.

that at Earlswood, Dr. Cobbold reports that one-fourth of the inmates are epileptic; whilst at the Royal Albert Asylum, where confirmed epilepsy is, by rule, a disqualification for admission, more than 10 per cent. of the patients suffer more or less from fits. In no less than 28 per cent. of 800 cases, of which I have the history, infantile convulsions have occurred, and in about 20 per cent. they are assigned as the cause of the idiocy. Nerve-storms such as these too often make shipwreck of the intelligence, but in many cases there is no doubt an inherited predisposition to nervous instability, for the origin of which we must look back to the circumstances of bygone generations. In England, unhappily, intemperance is but too likely to figure in a certain number of cases as an ancestral cause, for drunkenness is emphatically one of those sins of fathers which is visited upon the children "unto the third and fourth generation."

Time will not permit of further discussion of the specific constitutional taints associated with idiocy. Enough has been said to prepare us to expect a low standard of health amongst idiots as compared with normal children. Under the best hygienic conditions (such as those aimed at in the larger idiot institutions), there will be found a multitude of minor ailments proceeding from constitutional debility calling for the physician's care. Their feeble powers of resistance to cold, and their peculiar susceptibility to zymotic contagion, render idiot children much more liable to sickness than ordinary children, but in what ratio it is difficult to say in the absence of exact statistics with regard to the latter class. The death statistics of the idiot institutions as compared with those of the ordinary population at similar ages will, however, enable us to judge of the comparative vitality (and inferentially the health) of the two classes.

With regard to that most fatal quinquennium of child-life, I mean the period from birth to five years of age, we have unfortunately no materials for comparison. At only one of our large English institutions are children under five received, viz., at Darenth Schools, and in the Report the

statistics of age of the residents and decedents are not given in such form as will admit of comparison with those of the Registrar-General. (I may say parenthetically, that as the number of recognised idiots and imbeciles under five years of age is returned in the census of 1881 as only 451 (!) out of a total of all ages of 32,717, we shall see that any effort to discover their distinctive death-rate would be futile.) For several years past the annual Reports of the Earlswood and the Royal Albert Asylums have contained tables of residents and decedents in quinquennial groups of ages, and from these we can estimate the death-rates prevailing at successive periods from 5 to 20 years of age. Combining the figures in the Reports of the two institutions from 1879 to 1883 (including parts of 1878 and 1883), we obtain the following death-rates, calculated upon an average annual number under treatment at these ages, of 775.

Ages.	Deaths per 1000 resident at each age		
	Male.	Female.	Both Sexes.
From 5 to 10 . . .	52·9	44·6	50·1
From 10 to 15 . . .	31·6	38·8	33·9
From 15 to 20 . . .	46·0	43·2	45·1

In the Registrar General's 45th Report * the following is given as the mortality to 1,000 persons living at each group of ages for the five years from 1878 to 1882 inclusive :—

Ages.	Males.		Females.
From 5 to 10 . . .	6·3	..	5·9
From 10 to 15 . . .	3·3	..	3·4
From 15 to 20 . . .	4·6	..	4·9

Contrasting these figures and those above given, we may

* 45th Annual Report of Registrar-General for England, Tables 23 and 24. (*Mean* of Statistics, 1878–82.)

say, that the approximate ratios between idiot and ordinary mortality at the various ages are as follow:—

From 5 to 10, as 8 to 1.
From 10 to 15, as 10 to 1.
From 15 to 20, as 9 to 1.

So far as limited data are to be relied on, we may, therefore, conclude that the mortality of idiots between the ages of 5 and 20 is at least nine times as great as that of sound-minded children of similar age.

For the reason previously given, I have been unable to include the statistics of Darenth in my calculations. Had I done so the disparity between idiot and ordinary mortality would have been still more marked, as the death-rate there averages nearly 8 per cent. on the average number resident at all ages, against 4·4 at Earlswood, and 3·5 at the Royal Albert Asylum. The higher death-rate is no doubt due to the feeble character, tender age, and liability to epilepsy, which characterises the admissions to Darenth.

Turning now to the subject of the physical development of idiots as compared with mentally sound children, we shall not be surprised to note the almost uniform inferiority of the former class. Many idiots are undoubtedly small at birth; not a few have been prematurely brought into the world; but in nearly all imperfection of function interferes with due nutrition and development.* According to Dr. Kind's * observations, the difference in size between idiot and normal children is not very obvious during the first five years of life, but is more marked in the cretin class. It will be seen, however, from the appended Table and Chart (for which I beg to record my acknowledgments to Mr. C. Roberts, F.R.C.S., to whom some years ago I sent weights and measurements of 300 of my patients) that British idiots are shorter than the general population:—at 5 years by 1 inch; at 10 years by 2 inches; at 15 years by 3 inches;

* '*Ueber das Langenwachsthum der Idioten*,' von Dr. Kind, Langenhagen.

at 20 years by 3 inches. Whilst, as regards weight, male idiots are lighter than the general population: at 8 years by 4½ lbs.; at 10 years by 6 lbs.; at 15 years by 8 lbs.; at 20 years by 23½ lbs.; the disparity being greater in the male than in the female sex. It appears that the relative rate of growth of the two sexes of idiot children follows the same rule as that of normal children, and is subject to the same variations at the age of puberty, for a few years preceding which the growth of girls is in excess of that of boys.

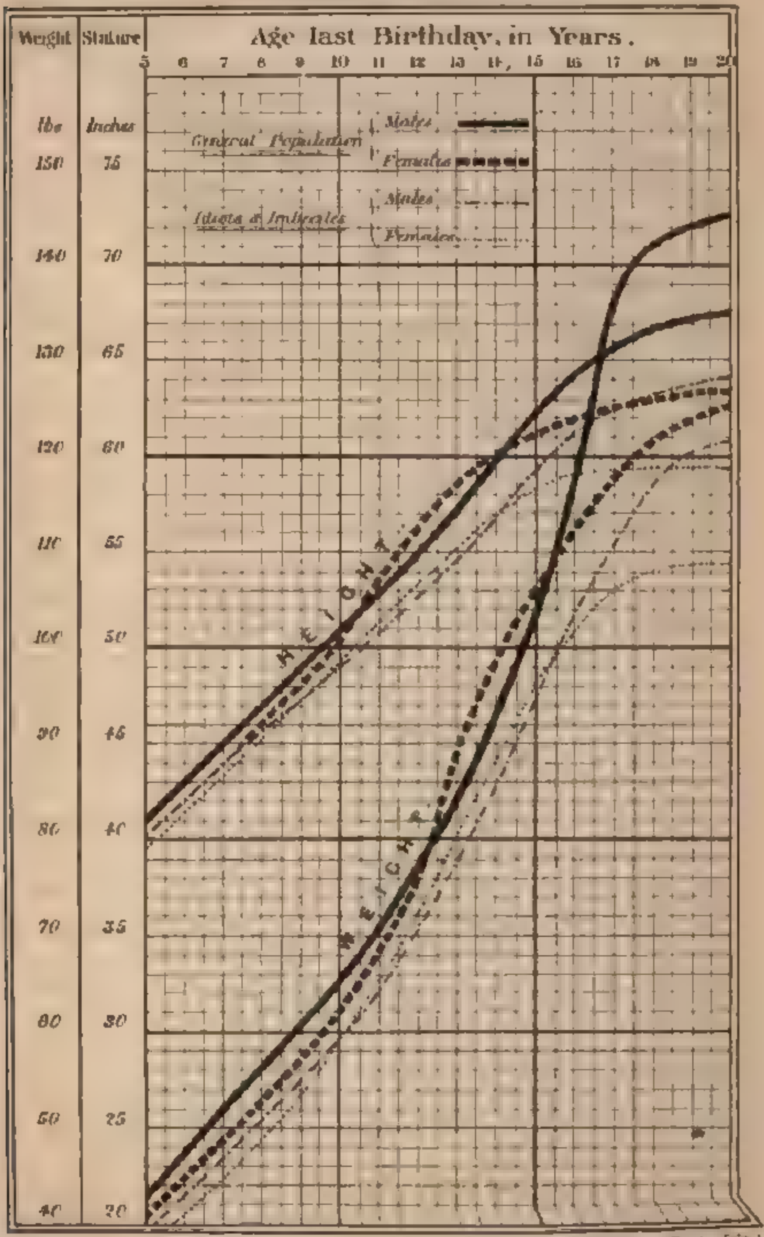
TABLE showing the Relative MEAN STATURE and WEIGHT of the GENERAL POPULATION, and of 1209 IDIOTS and IMBECILES in EARLSWOOD, ROYAL ALBERT, and LARBERT ASYLUMS.

Age last Birthday.	HEIGHT.				WEIGHT.			
	General Population		Idiots and Imbeciles.		General Population.		Idiots and Imbeciles.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
	Inches	Inches	Inches.	Inches.	lbs.	lbs.	lbs.	lbs.
5	41·0	40·55	40·0	39·5	..	39·2	39·0	37·5
6	43·0	42·88	42·25	41·25	..	41·7	43·0	41·0
7	45·0	44·45	44·0	43·25	..	47·5	46·5	45·0
8	47·0	46·60	45·75	45·25	55·0	54·1	50·5	49·0
9	49·0	48·73	47·5	47·5	60·0	55·5	55·5	53·0
10	51·0	51·05	49·0	49·0	65·0	62·9	59·0	59·0
11	53·0	53·10	51·0	51·0	70·0	68·1	64·5	66·0
12	55·0	55·66	52·5	53·0	77·5	76·4	70·5	72·0
13	57·5	57·77	54·75	55·0	85·0	87·2	77·0	80·0
14	60·0	59·80	56·5	56·5	92·5	90·7	85·5	88·0
15	62·0	60·93	59·25	58·0	102·5	106·3	94·5	95·0
16	64·0	61·75	60·75	59·0	117·5	113·1	103·0	102·0
17	65·5	62·52	62·5	59·25	135·0	115·5	110·0	106·0
18	66·5	62·44	63·25	..	142·5	121·1	116·0	108·0
19	67·0	62·75	63·25	..	143·7	123·8	120·5	108·5
20	67·25	62·98	64·0	59·5	145·0	123·4	121·5	108·5
21	67·5	63·03	64·25	..	146·2	121·8	122·0	..
22	..	62·87	64·5	..	147·5	123·4	122·5	..
23	..	63·01	..	..	148·7	124·1	..	..
24	..	62·70	..	..	150·0	120·8	..	..
25–30	67·75	62·02	64·75	59·75	151·2	120·0	123·0	109·0
30–40	..	..	..	..	152·5	120·8	..	..
40–50	..	61·15	..	..	155·0	118·6	..	..
50–60	68·0	..	..	..	157·5	104·0	..	..

In conclusion, it only remains to "point the moral" of my paper. In the first place, it would seem that, owing to the disproportionate tendency to disease and death

DIAGRAM SHOWING RELATIVE **MEAN STATURE** AND **WEIGHT** OF THE **GENERAL POPULATION**, & OF **1209 IDIOTS & IMBECILES**.

(C. Roberts, F. R. C. S.)



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(To illustrate Dr. Shuttleworth's paper Sc. I. P. E.)

amongst idiots as compared with normal children, all institutions for the education of the former class should be regarded as medical institutions, and be under the charge of medical men. Secondly, that the institutions themselves should be conducted with special regard to hygienic principles; that their surroundings should be open and salubrious, with ample space for out-door employment and recreation; that the buildings should be placed on a dry soil, be well lighted and ventilated, and at the same time well warmed; and that the dietary should be liberal, easily digestible, yet rich in the heat-forming constituents of food. (Special arrangements must necessarily be made, both as to structural accommodation and constant watching when epileptic idiots are received.) Thirdly, that education must proceed on physiological principles, starting with the improvement and training of the bodily powers, without which no mental improvement can be expected. How these desiderata are attained by cultivation of the senses, by judicious drill, by objective teaching, and by suitable industrial employment, it does not fall within the scope of my present paper to describe; but I would strongly advise such of my audience as are interested in the subject to inspect for themselves the work of some one of the special institutions. It has been aptly said, that in a well-managed idiot institution the intelligent visitor will find a species of "educational laboratory, where experiments may be tried, to the advantage of teachers and pupils of every grade." * Dark and dismal though the work may at first appear, the patient observer will, perhaps, by-and-bye be rewarded by seeing the cloud lifting, and, as he watches the process, exclaim with Prospero:

> "The charm dissolves apace;
> And as the morning steals upon the night,
> Melting the darkness, so their rising senses
> Begin to chase the ignorant fumes that mantle
> Their clearer reason."

* Report Mass. School for Feeble-minded, 1877.

FACTS CONCERNING IDIOCY AND IMBECILITY.

By Fletcher Beach, M.B., M.R.C.P.,

Medical Superintendent, Darenth Asylum.

Owing unfortunately to the short time that has been allotted to me for the production of this paper, it has been impossible to enter upon the subject decided upon by the Committee of this Conference, but I have thought that I might be able to give some particulars respecting idiocy and imbecility which may be interesting to the general public as well as the medical profession.

And firstly, what is idiocy? The old legal authorities defined an idiot as one who from his nativity hath been a fool or a madman; who has had no lucid intervals; cannot number 20; does not know the days of the week, or his own parents. This definition contains only part of the truth, as well as a statement quite contrary to the truth, viz., the confounding of a fool with a madman; and even in these enlightened days many people do not sufficiently distinguish the difference between the fool and the madman, or, as we prefer to say, the idiot and the lunatic. Dr. Bucknill defines an idiot as "a human being who, from defect or disease of the brain at a period of life before the mind has become developed, has suffered an arrest of mental development to such an extent that he is incapable of the ordinary functions and duties of social existence. The time of attack may be before or after birth; sometimes so late as four or five years after," and I would add, even later; "and thus the legal definition that idiocy is from nativity is not strictly correct." As Esquirol has well put it, "the man that is mad is deprived of possessions which he formerly enjoyed, it is a rich man become poor; whereas

the idiot has always been in misfortune and misery." Imbecility is a milder form of idiocy, not necessarily congenital, but supervening in infancy.

Dr. Bateman says "the poor idiot (from the Greek word ἰδιώτης) is alone in the world; isolated as it were from the rest of nature, he sees but does not perceive, he hears but does not understand or appreciate, he cares for nothing, and is alike indifferent to the grandeur as to the beauties of nature; he stands unmoved at the thunder-clap, the foam of the rushing cataract, or the roar of the mighty ocean; he heeds not the hum of the insect world or the song of the early lark, that winged chorister of the air; the star-bejewelled canopy of heaven, the mountain landscape lighted up with all the purple splendour of the setting sun—all these are nothing to him—he is a soul shut up in imperfect organs." These remarks, of course, refer to the lowest class, but any one who will make a visit to an idiot school will be struck with the various mental capacities of the children, ranging from one who leads a merely vegetative life up to another who attains a position close to the lowest of the perfect-minded. The insane man, on the other hand, has lost more or less completely faculties which he formerly possessed—there is perturbation of the mental faculties after their complete development.

This confusion between idiocy and lunacy which formerly existed, and even now exists, led in former days to the idiot and the lunatic being treated together in the same asylum, and at the present day, because asylums for idiots and imbeciles are not sufficiently numerous, many are kept in workhouses or in the wards of lunatic asylums, to the great disadvantage of both classes of patients. The Commissioners in Lunacy say, in their Report for 1865: "It has long been our opinion, as the result of extended experience and observation, that the association of idiot children with lunatics is very objectionable and injurious to them, and upon our visits to county asylums we have frequently suggested arrangements for their separate treatment and instruction. It is always to us a painful thing to see idiot

children, whose mental faculties and physical powers and habits are capable of much development and improvement, wandering, without object or special care, about the wards of a lunatic asylum. The benefits to be derived, even in idiot cases apparently hopeless, from a distinctive system, and from persevering endeavours to develop the dormant powers, physical and intellectual, are now so fully established that any argument upon the subject would be superfluous." We have to restore to the lunatic the faculties which he once possessed; we have to develop in the idiot the intellectual faculties which he never has possessed. I have dwelt fully on this subject because it is important that the essential difference between a lunatic and an idiot should be clearly recognised.

The history of the origin of the training of the imbecile is instructive. The first idiot who attracted the attention of scientific men was considered not to be an idiot, but a savage man—"un humain sauvage." The Savage of the Aveyron, as he was called, had lived all his life in the forests, without contact with his kind. He was taken to Paris, where he excited considerable curiosity and interest. Pinel, physician-in-chief to the insane at Bicêtre, declared him to be idiotic, while Itard, physician of the Deaf Mute Institution, asserted that he was simply wild or untaught, and undertook his education. At the end of five years, although he had immensely improved the savage, Itard was convinced that Pinel was right, and gave up the task of further improving the unfortunate being in disgust. His labours, however, were not as barren as he anticipated, for in 1828 M. Ferrus organised an idiot school in the Bicêtre, in which the pupils were taught all that is most important in the idiot schools of the present day. In 1831, M. Fabret established a school for female idiots in the Salpêtrière, and later Messrs. Voisin and Leuret, physicians to the Bicêtre, organised idiot schools in that asylum. In this school Dr. E. Sequin taught, and by various pamphlets and books has instructed the world in the manner of his teaching. In *1842*, Dr. Guggenbuhl opened his school for cretinous idiots

on the Abendburg in Switzerland, simultaneously with that for idiots of M. Saegert in Berlin. In 1846, Dr. Kern established a school at Leipzig, and in the same year Dr. H. B. Wilbur opened at Barre, Massachusetts, a private institution, which he afterwards left to conduct the school at Albany, in the State of New York. In the same year a school was opened at Boston, Massachusetts, under Dr. Howe, and now the United States boasts of nine or ten institutions in which more than a thousand imbecile children are constantly in training. The year 1846 also saw the establishment of the first institution for idiots in England by Miss White of Bath. In 1848, the next asylum was opened at Park House, Highgate, by Mrs. Plumbe and Dr. Andrew Reed, and this latter asylum has developed into the well-known Earlswood Asylum for Idiots at Redhill, Surrey, of which our esteemed Chairman of to-day was formerly superintendent, but who is now the proprietor of a large private institution at Normansfield, Hampton Wick. In 1850, Essex Hall at Colchester was opened as a branch of the institution at Highgate, and is now the Idiot Asylum for the Eastern Counties. The Idiot Asylum for the Western Counties was established in 1864, and the Midland Counties Asylum in 1866. Scotland meanwhile had not been idle, two asylums for idiots having been established in that country in 1863, one at Baldovan, Dundee, and the other at Larbert, near Falkirk. Ireland, too, about the year 1870, began to make provision for idiots and imbeciles, being assisted in her endeavours by the munificence of a member of the medical profession, Dr. Stewart, of Dublin. In 1870, the Royal Albert Asylum for Idiots and Imbeciles for the Northern Counties was opened at Lancaster, under the superintendence of my friend Dr. Shuttleworth; and in 1875 the first pauper school for idiots was opened at Clapton, London, under my own superintendence, the patients from which were removed in 1878 to the new and large school at Darenth, in Kent, under my direction. Numerous as these asylums may appear to be, they are simply insignificant when compared with the number of

idiots and imbeciles living in the United Kingdom. Excluding Scotland and Ireland, there are at the present moment more than 30,000, of whom a large number are improvable cases, and only a small percentage of these are trained and taught. More voluntary asylums should be built, and pauper asylums be constructed all over the country, so that every county or borough should have its idiot as well as its lunatic asylum.

The varieties of idiocy are very numerous, and run so much into one another that it is difficult to classify them, but I am accustomed to divide the types we meet with into two classes: those who are born so, the congenital; and those who become so after birth, the acquired class. It is unnecessary on this occasion to enter more fully into the question of classification, or to touch on the causation of idiocy and imbecility, and I therefore pass on to a description of the physical and mental condition of those who are the subjects of this paper.

The defects of the mind in idiots are closely related to those of their bodies, and, as a general rule, the greater the bodily defect the greater the idiocy. Taking first low-class idiots, we find that the sense of feeling is defective, and the ability to employ the sense of touch is usually deficient The special senses may be defective or perverted. The senses of smell and of taste are often deficient in this class, who will sometimes eat any disgusting object which comes in their way. There is also deficiency in the power of following moving objects with the eyes, which often wander restlessly about, not from blindness, but from non-perception, due to the state of the brain. Inability to distinguish colour, or to calculate the size and distance of objects, exists from the same cause. The ears are often large, implanted far back, and sometimes malformed, and the sense of hearing deficient, not from disease of the internal ear, but from the waves of sound being unable to excite sufficiently the nerves connected with hearing. Dumbness on the one hand, or a crying or screaming propensity on the other, is often noticed; and in those who can speak,

mumbling of words and irregular ejaculation of sentences are sometimes present. Irregularity of teeth and a highly-arched palate often exist, and add to the vocal difficulty, as do the open mouth and the inert lips. The proper amount of co-ordination between the muscular efforts of the lips, tongue, throat, larynx, and chest, is more or less deficient, and hence the principal cause of the defective voice. Inability to retain the saliva is very common, as well as inability to masticate perfectly or to swallow easily. The appetite is in many cases voracious, the digestion slow, the stools fœtid, and there is inability to retain the contents of the bladder and the bowels. The whole or part of the muscles of the limbs, hands, and feet, want co-ordinating power, and hence a waddling gait, with eccentric movements. The hands consequently have great difficulty in performing simple acts. Sometimes there is inertness of the body, sometimes great restlessness, and the muscles of a limb may be paralysed, or given to uncontrollable action. There are also many "to-and-fro" movements of the body, and movements of the hands and fingers which are called "automatic," as being independent of the will. The skull is often much below the normal size, and there is sometimes want of symmetry of the face. As a rule there is shortness of stature, especially in cretinous idiots, who are characterised by a broad face, pug-nose, thick lips, full and flabby cheeks, short arms and legs, large hands and feet, the presence of fatty tumours in the posterior triangles of the neck, and usually absence of the thyroid gland.

The defects of the mind are manifest in every degree from a merely infantile intellect of some, to the weak intelligence of those higher in the scale. Abstract ideas and intellectual perception are dull or wanting, and the notions of foresight, prudence, and self-preservation, are deficient or feebly developed. The memory is usually weak, and the power of attention often absent, as are the faculties requiring exercise of the will. Ability to compare and to estimate by numbers is seen in the higher classes. The gift of

imitation is strongly developed, but the firmness of purpose required in the struggle for existence is not present, and the judgment cannot be depended upon. Ideas of right and wrong, and the duties to one's neighbour, are absent in untrained cases. Obedience is difficult from deficiency of the will or want of attention. Emotions are passive or easily excited, while anger, obstinacy, &c., are the results of bad training. The affections are usually capable of development in the higher classes.

The diseases of idiots and imbeciles are of an asthenic type. Phthisis is frequent among them, and runs a rapid course in a few weeks, often unaccompanied by cough or expectoration. Scrofulous diseases and epilepsy are exceedingly common, the latter causing a large number of deaths. Disease of the brain or its membranes, and deaths from exhaustion due to diarrhœa occasionally occur, while bronchial affections carry off a large number annually. The general tendency is to physical degeneration. Nevertheless the death-rate—8·0 per cent. at Darenth Asylum, where all cases are admitted, and less than this in voluntary institutions for imbeciles, where more selection is practised—is not large, considering the class of cases with whom we have to deal.

From what has preceded it will be gathered that the ordinary teaching and education of sane children is not possible in the case of the idiot and the imbecile. Ideas which ordinary children acquire of themselves have to be specially imparted to the idiot, whose bodily condition requires special care and attention. We have, *firstly*, to strengthen the body and alleviate its defects, and, *secondly*, to undertake the special teaching of the mind. Referring especially to those who have to be trained in institutions, where alone the greatest advance can be made, it is necessary to secure a healthy site and good water supply, to provide lofty and well ventilated rooms, which are capable of being well warmed in winter, plenty of bath accommodation, and, above all, a liberal diet. If I may be permitted, I will here refer to the Darenth School for Pauper Idiots,

with which I am connected, the latest that has been built in England. It stands on a hill 200 feet above the sea, on a gravelly soil, and has abundance of good and wholesome water. It is built on what is called the block or pavilion system which is especially useful for the ease with which children of different bodily and mental capacities can be classified. Patients in good bodily health are located in three-storied blocks, while the infirm, the epileptic, and the helpless are specially provided for on ground-floor blocks, the dormitory and the day-room of which adjoin each other. The schoolroom block, on the ground floor, consists of a large room, in which three classes can be taught at the same time, out of which open four class-rooms. There are in addition a dining-hall, which is also used for purposes of recreation, and a chapel. Detached from the main building is a block in which all newly-admitted cases are kept for a fortnight, for purposes of observation and the prevention of epidemic disease in the Asylum; and in another direction an infectious infirmary, where all cases of infectious and contagious disease which occur can be efficiently treated.

Having put our patient in as good a hygienic condition as possible, we commence the different portions of his training, and first, as well as the foundation of all, the physical part. As Dr. Sequin says, "of all the incapacities of idiocy, none are so striking and none so detrimental as those which affect motion and locomotion." The muscles which are wasted must be nourished by calling their functions into activity, and the want of co-ordination shown by the entire absence of the ordinary precision of muscular movement must be corrected by properly applied exercises, in which the faculty of imitation should be made use of. The shuffling, waddling gait before referred to is due to a want of co-ordination of the muscles, and this must be overcome by a series of properly applied gymnastics. If there are any contractures or paralysis due to disease of the brain, the general and special nutrition of the affected limbs must be increased by the application of electricity

kneading the parts, and so on. The automatic movements, due to the want of the controlling power of the will, must be replaced by others upon certain definite plans. Habits are taught by repetition and are readily gained, if an early commencement be made. The muscular system being strengthened, the hands have less difficulty in performing any simple act, locomotion is improved, the dribbling from the mouth disappears, and the eyes wander less restlessly—in fact, the dull will-power having been sharpened, the listlessness and to a great extent inertness disappears, except in cases of the very lowest class.

The moral treatment has to go on side by side with the physical and the mental treatment. Obedience must be taught and efforts made to impart good temper and affection. The child has to learn these good qualities through the agency of the teachers and attendants, who should use all the means in their power to cultivate the faculty of affection in the patients. These children have affectionate dispositions as a rule, and by taking advantage of these great good results. There may be some difficulty in obtaining confidence and obedience at first, but the regularity of the institution, the obedience of others, and the general routine act upon the imbecile to so great an extent that the parents are often surprised to see such an improvement in so short a time. It is chiefly in the epileptic patients that outbursts of temper take place, but strict attention to their diet, treatment suitable to the case, and enforced quiet by separation from the others will usually suffice to calm the child.

The intellectual training in the lowest class of idiots commences by the cultivation of the senses, and as the tactile function is the most important, we commence by educating the sense of touch. This may be trained by the use of nail-boards, in which the nails are taken out and put back again, by the use of such forms as squares, circles and oblongs, which have to be fitted into the corresponding depressions in a piece of wood, by threading beads, building *with* bricks, and numerous other exercises which will occur

to the teacher, as well as by the things which are held and handled in the daily habits of life. The sense of sight is educated in colour by the aid of papers of various colours which the child should match, coloured cups and balls which he should pair, afterwards applying this familiarity to things of daily use; in form, by the use of the squares before mentioned; in the notion of distance, by making him separate objects at a distance from each other, and then taking measurements from point to point in a room or out of doors. The sense of hearing is trained by teaching the child to discriminate between the various sounds presented to his ear, or by the aid of music, of which nearly all imbeciles are fond, while a "speaking drill," making use of the gift of imitation, will be found to improve the faculty of speech. The senses of taste and smell are awakened by a series of experiments, and the qualities of objects thus ascertained. For instance, when the child is familiar with a certain number of objects by the use of sense, we shut his eyes and present them successively to his tongue or nostrils, which must discriminate between them without the help of the touch, sight or hearing. In every case we proceed from the simple to the complex, teaching ideas by the use of concrete forms and not by abstract notions, taking care not to prolong the lessons so as to tire the pupil. While the other portions of education are going on the patients must be taught to dress and undress, to be neat and tidy, and to use the spoon, knife and fork. Having educated the senses, we proceed to higher branches of learning, the teaching of the alphabet and of reading (the method of word-cards is useful), writing, dictation, arithmetic, drawing, and a little elementary geography, and the idea of weight and the value of money by the shop lesson which our President happily first instituted. When some progress has been made, instruction in tailoring, shoemaking, carpentering, mat and brush making, and gardening for the boys, and in domestic work and in sewing for the girls, proves useful, alternating the industrial with the purely intellectual training. Varied amusements,

both in summer and winter, should be provided, for if the old adage, "all work and no play makes Jack a dull boy," is applicable in the mentally sane, how much more is amusement necessary in the training of imbecile children, whose very dulness we are trying to remove!

It seems scarcely necessary after what has been said to prove to any one that the training above mentioned is wanted for the evolution and improvement of the dull minds we have to treat, and yet now and then one hears a doubt as to whether the school department is of any use. Those who speak thus display an utter want of knowledge of the subject, for it is this very training in the schoolroom that is the foundation of the whole system. It is of no use putting imbecile children to industrial work until some elementary knowledge of size, form, colour, &c., has been developed. The advance in knowledge which the pupil makes in the schoolroom is the gauge of his mental progress, and as a general rule those who make the most improvement in the schoolroom make the most progress in industrial work.

To those who say with reference to the work I have described *Cui bono?* I answer, listen to what Dr. Sequin, who may be regarded as the pioneer in this work, says after thirty years' practical experience in the education and training of idiots and imbeciles. He says, "idiots have been improved, educated, and even cured; not one in a thousand has been entirely refractory to treatment; not one in a hundred who has not been made more happy and healthy; more than thirty per cent. have been taught to conform to social and moral law, and rendered capable of order, of good feeling and of working like the third of a man; more than forty per cent. have become capable of the ordinary transactions of life under friendly control, of understanding moral and social abstractions, of working like two-thirds of a man; and twenty-five to thirty per cent. come nearer and nearer the standard of manhood, till some of them will defy the scrutiny of good judges when compared with ordinary young men and women." Such testimony as this

cannot be impugned, and ought to be a sufficient answer to the critics.

I am quite aware that the few disjointed remarks which I have made only represent an oft-told tale, but I trust that, disjointed as they are, they may be useful to the general public, in whom it is necessary to create an interest, in order that more institutions of the kind may be founded, as well as to the medical profession, in whose hands the treatment of these patients rests.

DISCUSSION.

A vote of thanks having been passed to the authors of the papers,

Dr. ROTH said he was very glad to find that Dr. Beach as well as Dr. Shuttleworth relied so much on physical education, which was really the basis of all education. He regretted they were not honoured that day by the presence of Sir James Paget, who made some remarks on the previous day with regard to gymnastics, which he should have been glad to correct; and as there was no opportunity of answering him then, he hoped to do so in a published letter, because it was not right that the opinions put forward by that eminent surgeon should go entirely unanswered. His attention had been called to this class of diseases from time to time, in one case having a child brought to him who was blind as well as dumb. The importance he attached to physical education was shown by the collection he had placed in the Exhibition. He would not restrict it to idiots, but would make it general in all schools, because the senses of children were too much neglected. In all schools physical education should take the first part, for not until some progress had been made with that was it time to go to the everyday education of the sexes. He regretted that the authors had not said more about the causes of idiocy. One

special cause was marriages between sick persons of the same family, or who had the seeds of scrofulous or other complaints, and it was very desirable, as no law could be passed to prevent such marriages, that they should be prevented by the force of public opinion. Rickety children were included in the programme of the Conference, and the question was what was to be done with them in England? The plan seemed to be to let them become cripples, and then provide homes for them, but he had visited institutions in Italy where care was taken that rickety children should not become crippled. The great merit of having done something in this way belonged to Count Ricaldi, who, with the assistance of Professor Gamba, established an institution in Turin where they were received, and a charitable society provided food and medicine, and they were well cared for, and everything done to prevent the further progress of the disease. Last time he was in Turin he found there were five such schools, and he was interested to see how under good food, medical and domestic treatment, many of them had partly recovered; the progress of the deformity was arrested, and they were developed into useful members of society. In Milan similar efforts had been made, some of the greatest ladies there collected funds for the purpose, and a large institution was now established in the outskirts, where children in their first infancy were taken and treated. Everything was done which the present state of medicine and surgery permitted to prevent the further development of the disease, and so much had public opinion been enlightened that when a mother had a baby showing the first symptoms of rickets she knew there was something wrong, and instead of saying nothing about it, as poor mothers did in England, applied to the dispensary and received tickets, in exchange for which she got milk and other necessaries, because in the majority of cases rickets in children were caused by bad food and defective assimilation. In this way it was hoped that rickets would become very rare. These children were found to come first from the porters' lodges which were

attached to all large houses, and which were generally very insanitary dwellings, and next from drunken parents. They now knew in Milan where they were produced, and with the help of the Bureau d'Hygiène they hoped to put a stop to this disease.

Dr. CHARLES DRYSDALE said he wished to express his great admiration for those gentlemen in the profession who had devoted themselves to the care of this most unfortunate class. He knew no class of the community more to be pitied than idiots, and there was nothing greater or nobler than the devotion of those who gave themselves up to the care of such forlorn people. The Chairman was, above all others, to be praised for his devotion to this subject, for all the medical profession looked upon him as one of the first who had paid attention to it. He was by no means especially familiar with these diseases himself, though he continually saw such cases, and he had made it his business to visit a number of these asylums, and could therefore corroborate what had been said that there was a certain percentage of idiots who could be improved up nearly to the level of ordinary humanity, and if only five or six per cent. of such infants were brought to be like their neighbours, it was an immense gain. Some people said, what was the use of paying attention to such a small number of cases when there was so much affliction all round that it was hardly worth while to do so little good? but happily with high civilization they were not contented with allowing any one to remain out in the cold, but endeavoured as far as possible to make the life of every person tolerable. With Dr. Roth he could have wished to have heard something more about the causes of idiocy. He had often heard it said that intemperance on the part of the mother, but most commonly the father, was a frequent cause, and it would be very useful to know the percentage of such classes. Another important point touched upon by Dr. Roth was one more for the future perhaps than the present, the question of parentage. If ever the time came when the human race cared as much

for its own offspring as for the lower animals, and endeavoured to bring into existence only the best specimens, there would then be as much attention paid to this matter as there was to the breeding of cattle and sheep. At the present time all this was neglected, but according to the statistics of Dr. Shuttleworth, it was perfectly clear that idiots were produced by scrofulous and consumptive parents, and it had often occurred to him, and had often come under his observation that consumptive parents had scrofulous and rickety children, or they suffered from some other disease. It was the artificial life lived in towns which degenerated the race; it became weaker and weaker, and after living in cities a long time the children became scrofulous, from which every other disease was engendered. At least persons who were so afflicted might be expected to take care that such dreadful diseases were not perpetuated. The high death-rate which had been mentioned amongst idiots quite accorded with his own observation, and he believed that a large proportion of all idiots died before they arrived at maturity; and that the mortality in the first five years of life was very great. With regard to treatment, there were now a certain number of asylums for these children, but they would not accommodate more than 10,000, whilst there were 30,000 in England and Wales. In France also there were a large number of asylums for scrofulous children, and there was a large bathing infirmary at Bains-au-Mer, much larger than the Margate Infirmary. He should like to ask the opinion of these two gentlemen whether it would not be well to employ these children to a large extent in agricultural pursuits. He entirely agreed giving them gymnastic exercises, and also intellectual training, and music also was important; but he could not help thinking that if they were put on a farm and learned how to weed and dig, it would keep them in the open air, and would be the best thing for them. He believed the only way to regenerate mankind was to leave the town and return to the country.

Miss EDITH LUPTON said she should like to say a few

words with regard to a class of children in the Board Schools who could not be said to be idiots, and yet were certainly not in full possession of their faculties. There was a form of disease known in Bradford which consisted in an enlargement of one side of the face and cheekbone. She had not had a medical opinion upon the matter, but was told by the schoolmaster it was a form of goitre, and produced the same effect of mind; at any rate these children were of a very low type of intelligence, although they were not idiots. They were passed by the surgeons to go to the mills, and were able to work, but could never do their lessons in school; and the sufferings of these poor children were very great. Her attention was first drawn to it by noticing a half-time boy, eleven years old—a full-sized boy—who had this remarkable swelling, and the master pointed him out, and said he could either read, or write, or do sums, but no power on earth could make him do all three together. He would go backwards and forwards from one subject to another like a shuttlecock; and she should never forget the hopeless misery on his face, and it was evident he was frequently subjected to punishment. The master said it was absolutely of no use, for he had had him under his care for a long time. Again, another boy who positively could not read or write, though he could make some marks on paper, was passed by a kind-hearted inspector into the second standard, where he had to do other lessons. Parents would not allow their children to be taken away from home, and were very jealous of their children being called deficient. It was necessary therefore to treat these children in such a way as not to mark them out from the others; and she hoped one result of these Conferences might be the examination of all children when they first went to school, so that they should not be put to tasks they were unable to perform. In a large infant school the other day she saw a class of eight or ten boys by themselves, and the mistress said she had to spend nearly all her time screwing these children up for the inspector. They had all the marks of disease, and one of the little

boys was being slapped by the teacher in charge. When she asked if he was naughty, she said, "No, only he could not understand." These children should not be kept to lessons hour after hour, and slapped because they could not understand. They required more open-air exercise, and ought not to be screwed up in that way for the inspector. There is no doubt absolute injury arose from idiots in schools, for not long ago one boy was killed by an idiot, who was then sent away to an asylum, where he ought to have gone before. Referring to what had been said by Sir James Paget on the previous day, he excepted Board School children in his remarks on gymnastics, because they had no other opportunity for relaxation. In Bradford they had large playgrounds to all the schools, but they were hardly used. The infants went into them for about ten minutes in the morning and in the afternoon, but the elder children could not be said to use them at all. On one occasion the pupil-teachers had a game of football, and then a message was sent down from the Committee that they must not do so any more, as it would spoil the playground. She hoped the time would come when they would have swings and giant-strides provided, and that the school-keeper would not be allowed to shut the gates and lock them as soon as the children left school. Now they came out of school and went into the street to play, because the playground was locked, which was perfectly preposterous. These Board School children did not know how to play, and therefore wanted some system of organised gymnastics; but the feeling of the ratepayers was such at present that they could not go in for any apparatus, or give much time to it. The parents were not yet sufficiently enlightened to wish for it, and anything elaborate would create a feeling of opposition; but this was a matter which ought to be taken up as strongly as possible by all the Boards of the country. On behalf of the provincial school managers she must express her obligation to the medical men who had attended the Conference, and come forward to speak on behalf of the sufferings

of the children, and she must express her regret at the manner in which Government had received the report of Dr. Crichton Brown, and others. A gentleman in Bradford, who had taken up the matter with great zeal and ability, had been invited to come and speak at this Conference, but he said he had lost all heart, and was now disposed to say that the Liberals might bury all the children if they wished. That feeling was beginning to spread in consequence of the way in which the Government were attempting to discourage and put a stop to all medical inquiry. Mrs Garrett Anderson said the matter rested entirely with school managers and teachers, but as a school manager she must disclaim it; they had scarcely any power at all, being completely bound by the regulations of the Government. It was the money question which was vitiating everything, and they would never effect any real improvement until they got rid of that dreadful system. They heard how wicked it was for teachers to wish for money, and in Bradford they had given up paying the teachers by the grant, and gave them fixed salaries, but then the managers took the grants, and the result was that whereas before if the children did not pass well the teachers lost perhaps £30 to £50 a year, now, if they did not pass well, they were dismissed straight away, because the managers said they could not afford to do without the grant. In very large towns like London, Liverpool, and Manchester, it was not felt so much perhaps, but in Bradford, and small towns suffering from depressed trade, where the rates were a very great grievance, any Board which increased the rates would have no chance of being re-elected. One of the leading London journals, in speaking of this question, said if they could not obtain the Government grant without over-educating the children they must do without it, and added that it was possible to conceive a state of things in which it might be right for the Government to offer a reward which it would not be right for the managers to try for, which seemed to her perfectly absurd. Mr. Mundella himself acknowledged that amongst the lower class

of children, who were badly born and bred, were found those who could not earn the grant, in which the attention paid to the health and the moral standing of the children prevented sufficient attention being given to subjects which earned the Government grant; but that was exactly the class of school which required Government assistance. Were not they the very children for whom the Education Act was passed? The Government sent down money, and those who got the money were the well-to-do children of parents who had the means of educating them without the Education Act. Before anything substantial could be done there must be a more rational system of payment. She was particularly struck also by the way in which this matter was treated by the Press when writing education articles. Did they refer to the improvement in knowledge and in health? No; it was only figures—how many more children were going to school, and how many shillings a year each child earned. Some years ago Leeds was found guilty of earning only 14*s*. per head, while the neighbouring towns earned 15*s*., and the Press took this up with ardour, and said how disgraceful it was that the largest town in the district could not earn as much money as little towns in the neighbourhood, and since then the Leeds School Board had been striving every nerve to earn more money. If they got rid of these money grants, and adopted the German and American system of each school being supported out of the rates, and allowing parents in each town to bring up their children as well as they could, there would be a very different style of things. Towns would then compete with one another in the good they were doing; it would not be money, but health and progress which would be the test, but this could never be done until they got rid of the fatal system of payment by results. Again, children should not be allowed to go to work on an intellectual test. It was most desirable that they should not be allowed to work until they were fit to go, but let that be by age or by special examination of each child, not by a Government pass

examination. It was said the other day that competitive examinations were bad, but the test examinations did no injury. In Bradford it injured the children very much, for there were many cases of illness. The children were cruelly anxious to get to work, as might naturally be expected if they were hungry, and the getting of a good meal depended upon their doing so. There was one case of a poor boy who lost his mother, and, his father being in a lunatic asylum, he was supported by charity. He was naturally anxious to earn his livelihood, and worked up hard for the examination, being promised a good place as soon as he passed. He worked night after night, and then went down to the examination, and was seized with a faint, which lasted many hours, and left him extremely weak; and when examined by the doctor he said that the excitement had produced a tendency to meningitis, and unless he had rest and great care were taken he would be completely ill. There were many other cases at the same examination, although not perhaps quite serious.

Dr. TOWNSEND said he would give a brief history of an institution with which he was connected in Ohio. About thirty years since he found himself elected to the Senate, and, being a medical man, naturally began to look for those measures bearing on the public health which might be expected of him; they had good institutions for the education of the blind and deaf and dumb, and certain others for the poor, but there was nothing for the education of imbeciles. Now, after taking his degree in medicine in the United States, he came to England in 1840, and subsequently passed a year in Paris, where he learned what had been done by Pinel and Itard, and subsequently made the acquaintance of Monsieur Seguin, so that he naturally thought of this unfortunate class. Now, in America the Governor of the State, before the meeting of the Legislature, sent a message in which he called attention to anything he deemed necessary, and the Governor being a personal friend of his, he asked him if he had made any reference to a provision for the education of imbeciles. He

said no, he did not know that anything could be done for them; and on his showing him that it could, he gave him permission to insert a few words in the message. Accordingly, when it was read it contained, amongst other things, "Beg to call attention to the necessity of making provision for the training of imbeciles and idiots." As soon as the message was read, Dr. Townsend moved that that portion of the message be referred to a Select Committee; this was appointed, of which he was chairman, and a report was made in favour of it. This was followed by a small appropriation, and three trustees were appointed to visit three schools which then existed, one in Massachusetts, another in Pennsylvania, and a third in New York. They visited these schools, and obtained information, and then the Legislature put at their disposal some $8000; with that they rented a house, chose a matron and teacher, and a medical man for superintendent, and filled the establishment with 15 pupils. That school had now grown until they had between 600 and 700 pupils. Then the trustees reported that it was a success and asked for a large sum to enable them to buy a farm; $100,000 were voted for that purpose. With that they bought 180 acres close to the city of Columbus, and another $100,000 was voted for the building. Last year they had a terrible misfortune, the building being burnt. Though he was not then a trustee he was connected with another institution in sight of it; and he was happy to say that, though there were 600 children in the building, they were all got out by the skill and good management of the 30 or 40 young lady teachers, though they lost every particle of clothing but what they were wearing. He was glad to say, however, that the Legislature made an appropriation to make up that loss, and the building was now being rebuilt and was almost finished. He would give details of one case which occurred in that institution. A little boy named Johnny Horner was brought there who could not walk and could not speak. The first step with the new inmates was to make them clean, give them plenty of good air and nutritious and easily digested food, and each case was

carefully studied by itself. Before Johnny's case was fairly understood, some travelling musicians came round, and the superintendent paid them something to go in and play. Johnny showed his interest in the music by rolling over and over, which was his mode of progression, until he came to the feet of the man playing the harp, and there he looked up and drank in the sounds. He thought he would see whether anything could be done to develop what seemed to be a liking for music, and so he told the musicians to repeat the tune over and over again as long as they stayed; afterwards he asked the teacher to play the same tune on the piano to see if Johnny would recognise it, and he then put some of the eldest boys to march, at the same time taking Johnny between them, and he was told he must march. This was repeated day after day, and finally, to cut a long story short, in two years Johnny was an expert dancer and had become a chorister of the little school, and in two years more the parents of this little boy came and took him away, finding he was then fit to go to an ordinary school. This was perhaps rather above the average of cases, but it showed what could be done. With regard to the causes of idiocy: at the time the fire occurred there were 1500 cases tabulated, in which they thought they could put their finger definitely on the trouble in each case, and in three days the manuscript would have been sent to the printer; but the fire came and it was destroyed, and the superintendent was not able to carry in his mind any percentages or details, so that the whole work of twenty years was entirely lost. He should state that they did not receive any cases of epilepsy or fits, but the death-rate, with the exception of epidemics, had not exceeded that in the deaf and dumb or blind asylums. With them it did not appear that consanguineous marriages as such were a common cause. If two cousins were absolutely healthy, so far as they could discover, there was no impediment to their marriage; but if people were diseased, cousins or not cousins, and they married, of course that exaggerated the trouble infinitely. The conclusion they had come to was that there was a

large number of people who ought not to think of marrying at all. Men or women who had not a reasonable prospect of bequeathing a healthy and good constitution to their children should make up their minds not to marry and thus perpetuate the defects and diseases to which they were liable. One important point was the influence of agricultural labour; they had one farm of 180 acres, and had bought another, for there was no doubt that labour on the farm and gardens was especially adapted to the wants of such children, and they found no great difficulty about it. One year they had a very large crop of Indian corn, which had to be husked; there were fifty or sixty boys who could be put to that work, and the way it was done was this: a young man who had charge of it picked out four boys and told them he wanted them for captains, and therefore they must ask every question, and learn everything they could, and he instructed them during one day in this operation. The next day each of these boys took four other boys with him, and the next day these four had others under them, and so it went on, and the whole work was done very satisfactorily. He had often observed the same thing to which Miss Lupton had referred, a one-sided swelling of the cheek; but a great many idiot children had deformed heads, and nearly all children were a little one-sided, which he attributed in some degree to the way in which mothers carried their babies; if they carried them constantly on one arm it would tend to flatten the face on that side.

Miss LUPTON said in the cases she referred to one cheek was twice the size of the other.

Dr TOWNSEND said there were cases of extreme deformity from hydrocephalus, but he did not wish by any means to assert that a slight deformity in the face was an indication of idiocy.

Dr. W. R. ROGERS said those hatters who took measurements by a certain instrument were well aware that numbers of persons were deformed in some slight manner or other, and that in fact very few heads were perfectly normal and symmetrical.

The CHAIRMAN said they must all feel deeply indebted to Miss Lupton for coming to the Conference day after day, and enforcing such sound common sense on the question of education. He had seen many instances of unsymmetrical faces to which she had referred, and always thought it was due to pressure on the carotid vessels, very often from an enlarged thyroid gland, thus producing unequal nutrition on the two sides. He had now under his observation two or three girls in whom this was very marked, where the face, but not the cranium, was unsymmetrical. Unsymmetricality, however, was not a proof of idiocy, for the particular idiotic type of brain was perfectly symmetrical, as was also the brain of an ape. Regret had been expressed by some gentlemen that the causes of idiocy had not been more alluded to, but he would observe that there was nothing more difficult than to fix upon any distinct cause for any case of idiocy, and it very rarely happened that there was only one cause; there were generally two or three concurrent factors, and it required great philosophic care to decide which was most important. As Dr. Townsend had stated, a frequently assumed cause of idiocy, consanguineous marriages, was very rarely found to operate. Some ten years ago he began writing a paper to prove that this was the main cause, but in the course of his investigations he became converted, and published a paper in the London Hospital Reports containing a body of evidence which went far, in his opinion, to prove that marriages of consanguinity were not *per se* a cause, but, as had been so well explained by Dr. Townsend, where the two parents were unhealthy there were two factors operating instead of one. If the district medical officers of health had the selection of cousins who might marry, he had little doubt that it would improve the race of Englishmen. No doubt intemperance was a potent factor, especially amongst the lower classes. He would remark that Dr. Townsend brought with him a letter of introduction to Dr. Shuttleworth from the Institution in Ohio which he had described, but it was not

described as an asylum for idiots, but for the "feeble-minded." One of the objects of the meeting should be to enforce on the public the desirability of establishing more institutions or schools for the education of this class of children; but the word idiot need not be used, it was looked upon as a term of opprobrium, and should never be applied to feeble-minded children. The typical idiot was a child who had no faculties whatever—no power of thought, and no sense of smell, taste, hearing, or touch, and such did not exist except in books; and to call the various grades of feeble-mindedness which came under the care of the directors of such institutions as they had in view idiocy, was a great obstacle to the cause. He was constantly having such children brought to him, but the parents always insisted that these children were not idiots; they would never admit such a thing. The name Idiot Asylum was also injurious in another way, as it conveyed the idea of the child being put away, and it would be much better to call such institutions Training Schools, which they really were. As had been well shown in the the two papers, the death-rate amongst such children was always above the average, and it was of the utmost importance in establishing such institutions to select a healthy site; they should never be built on clay, otherwise the children would never improve physically or develop mentally. Some years ago he wrote a paper for the *Lancet* on the connection between tuberculosis and idiocy, but he believed now it should have been on the connection of a clay site and idiocy. As to the employments of the children, it had been well shown by Dr. Beach that the educational training must go on *pari passu* with industrial pursuits. It was quite useless to expect boys of this class to be trained on a farm, or in a carpenter's shop, alone; the school training must go on at the same time. A boy could not learn carpentry if he was unable to read the figures on his rule, and to tell the difference between one inch and two; there should always be intellectual training in the morning, and industrial training in the afternoon.

With regard to the class of children whose sad case Miss Lupton had so graphically described, those who were slapped because they could not understand, he feared they were but too common in the London Board Schools, and seriously diminished the grants to the managers. The only cure was to have special schools or classes for backward children. There was a numerous class of children, outside the feeble-minded, who were simply backward, and only encumbered the ordinary schools; they irritated the teachers, did no good to themselves, and hindered the progress of others. In the upper classes of life one saw numbers of these cases, and there must be a still larger number amongst the lower strata of society: boys who had just sufficient intellect to make them cunning if bullied, and to make them untruthful if they were punished. They were the boys who came home from the public schools bringing half-a-dozen watches in their pockets, not knowing whom they belonged to, or who were expelled for untruthfulness and low cunning. They were quite distinct from the feeble-minded, and required special treatment.

Dr. SHUTTLEWORTH, in reply to the observations which had been made, said the causes of idiocy were outside the limits of his paper; and, as the Chairman had remarked, there were so many concurrent causes that it needed the utmost care to lay one's finger on this or that in any particular case and say it was the special cause. He had endeavoured to go through his case-books and tabulate the causes of idiocy, as far as they could be learned from the statements of relatives, assisted by his own observations and other sources of information, but he had not as yet ventured to publish the results. All these cases required a great deal of mature consideration, and it did not do to accept as gospel all the statements which the friends or relatives made. You were frequently told that there was no defect in the family except in the case of the individual child. But as time went on you found from the visits of the relatives that there were all varieties of physical infirmities, more or less correlated with idiocy, in

the family, particularly evidences of scrofula and phthisis; and after watching carefully in this way for some time, one was able to get at the root of the thing much better than by publishing statistics hurriedly. In the course of a little while he hoped to be able to give the results of his past fourteen years' experience, gathered from some 800 cases, in which he had obtained tolerably exact information. Taking the percentage roughly of the concurrent causes, he believed in about 20 per cent. there was phthisis in the family history, and in 20 per cent. insanity or imbecility; but not in more than 4·4 per cent. was there evidence of consanguinity between the parents or grandparents. So far as his experience went, in not more than 10 per cent. was there evidence of intemperance, though, if he knew more, that figure might have to be increased. It must be borne in mind, too, that the majority of children in the Royal Albert Asylum were not paupers, but belonged to the working class, with a few from the higher social grades. No doubt amongst paupers the prevalence of drunkenness as a factor would be greater. He wished some school could be established in every large centre for the backward children, of whom Miss Lupton had spoken, who were not able to bear the strain of the ordinary schooling. After a certain time spent in such a special school a selection might be made, and some would be fit to enter an ordinary school, while others ought to be sent to an idiot asylum, or, as the Chairman much better designated it, a "training school for the feeble-minded." The employment of imbecile children in agricultural pursuits had been referred to by Dr. Drysdale as desirable, and that was the experience of all who had had to do with special institutions. All the large establishments in this country had ample farms for the employment of their children, though they did not go in for farming with a view to mere profit. At Lancaster they had 100 acres, on which the children were employed for the benefit of their health as well as for the sake of the produce. There were about sixty or seventy boys who worked on the land, and many of them did very

useful work, whilst a certain proportion did work which was no doubt useful to themselves, but was not very productive in a pecuniary sense. Economists might ask why these institutions should hold land which paid but little, but the answer was that it was the very best means of employment for improving the physical and mental condition of the inmates. He, with Dr. Beach, had visited the American institutions, and could bear testimony to the very good work which was done there. It was now some years since they were there, namely, in 1876, and what then struck them most was the excellence of the scholastic work, the industrial being hardly equal to what was done in England, though he ought perhaps to except the institution in Ohio, where they had an admirable farm, and the boys did a great deal of outdoor work; and he was glad to find that now some of the other establishments which had been at first located in town had gone into the country. In England the work was much trammelled by the question of ways and means, the Darenth school being as yet the only one which was supported at the cost of the rates; all the others were more or less charitable institutions, except those which were in private hands. The Royal Albert Asylum at Lancaster had certainly been most munificently supported, for, having been opened fourteen years ago, it now had between 500 and 600 inmates, and, besides a fine building and an estate of 100 acres, there was an endowment fund of nearly £100,000, so that it was evident that the sympathies of the people in the north were strongly in favour of such institutions. At the same time they were often painfully impressed, when the limited time for which the children were received expired, with the necessity of some further provision being made for them; and there seemed a great need for some institution for children above the pauper class, who, having received a certain amount of training, were still unable to take care of themselves. There were certain matters also in connection with lunacy legislation which required alteration. At present every patient whom they received—little children six years old

even—had to be certified by two medical men, just as if they were adult lunatics. This seemed absurd, and acted as a deterrent on parents sending their children for education. In conclusion, Dr. Shuttleworth said he had placed in the Educational Department in the Exhibition a collection of appliances used in the training of imbecile children, which he should be glad to explain to those interested in the subject.

Dr. FLETCHER BEACH said one reason why he had not gone into the question of the causes of idiocy was that he considered that rather more fitted for a medical than a popular audience, and that some of the other points required the attention of the public more than the causes. His statistics, however, were of much the same character as those of Dr. Shuttleworth. Some years ago at Cambridge he read a paper on the intemperance of parents as a cause of imbecility in children, but in some 500 cases he had gone through he found it very difficult to get satisfactory evidence. Very often the children who came to Darenth were picked up in the streets, and nothing whatever was known about their parents; they were first taken to the workhouse, and, on being discovered to be imbecile, were sent to him. In those cases where he saw the parents he tried to get at their history, and in about 6 or 7 per cent. of the cases he found intemperance was the cause *per se*, but when combined with other causes, such as imbecility, insanity, and epilepsy, it went up as high as 35 per cent. Soon after that he saw a paper by Dr. Kerlin, and his statistics came to very nearly the same as his own. No doubt there was more intemperance amongst the parents of pauper children than in the middle classes, amongst whom drunkenness was now happily looked upon as a disgrace; and he hoped in time the same ideas would spread to the lower classes as well; but unfortunately there was too much tendency, from the want of higher and better forms of recreation, to fly to the public-house. The question of consanguinity had been worked out very fully, and it could not be credited at being the cause of feeble-

minded men in more than 2 per cent. of the cases. If both sides of the family were defective, there was every probability of the child being defective also, whether the parents were related or not. The death-rate was heavier in the Darenth Asylum than in those supported by voluntary contributions, because they had to take in all cases without any selection, often as young as three or four years of age, and some in the weakest possible condition. He had sometimes told the managers that it was no use taking in some of these children; but they said it was a State-supported institution, and all imbecile children, no matter what their condition, must be admitted. If he could select the children, he should be able to show much better results, but while they were hampered with a number of epileptic and extremely infirm children, they of course lowered the average. There ought to be a separate department for them, and if they were eliminated, he believed they would be able to send out, as they did in America, 20 per cent. who might be considered cured, and able to take their part in the business of life. There was no doubt that farming was the most favourable occupation; it was no use keeping children of feeble mind indoors all day; after a little schooling they wanted to run out and play about, and they were of great use on the farm; and even if they did not do very much work they were happy in the open air, and their health was greatly improved. One of the most important things was what Miss Lupton had referred to, that all children should be medically examined before entering the Board Schools; this would often prevent the introduction and spread of infectious diseases; and not only so, but there ought to be a periodical inspection to see that the children continued in health, and were not being overworked. For want of this he believed many a child died of tubercular meningitis.

The CHAIRMAN said he had taken a great deal of trouble to ascertain the number of consanguineous marriages amongst bread-winners, or rather how many were the

children of first cousins, and after examining about 5000 who were patients at the London Hospital, he came to the conclusion that about 5 per cent., or one in every 2000 of the whole population, were the offspring of such marriages.

Dr. CHARLES DRYSDALE then moved a vote of thanks to the Chairman, which was seconded by Dr. TOWNSEND, and carried unanimously.

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